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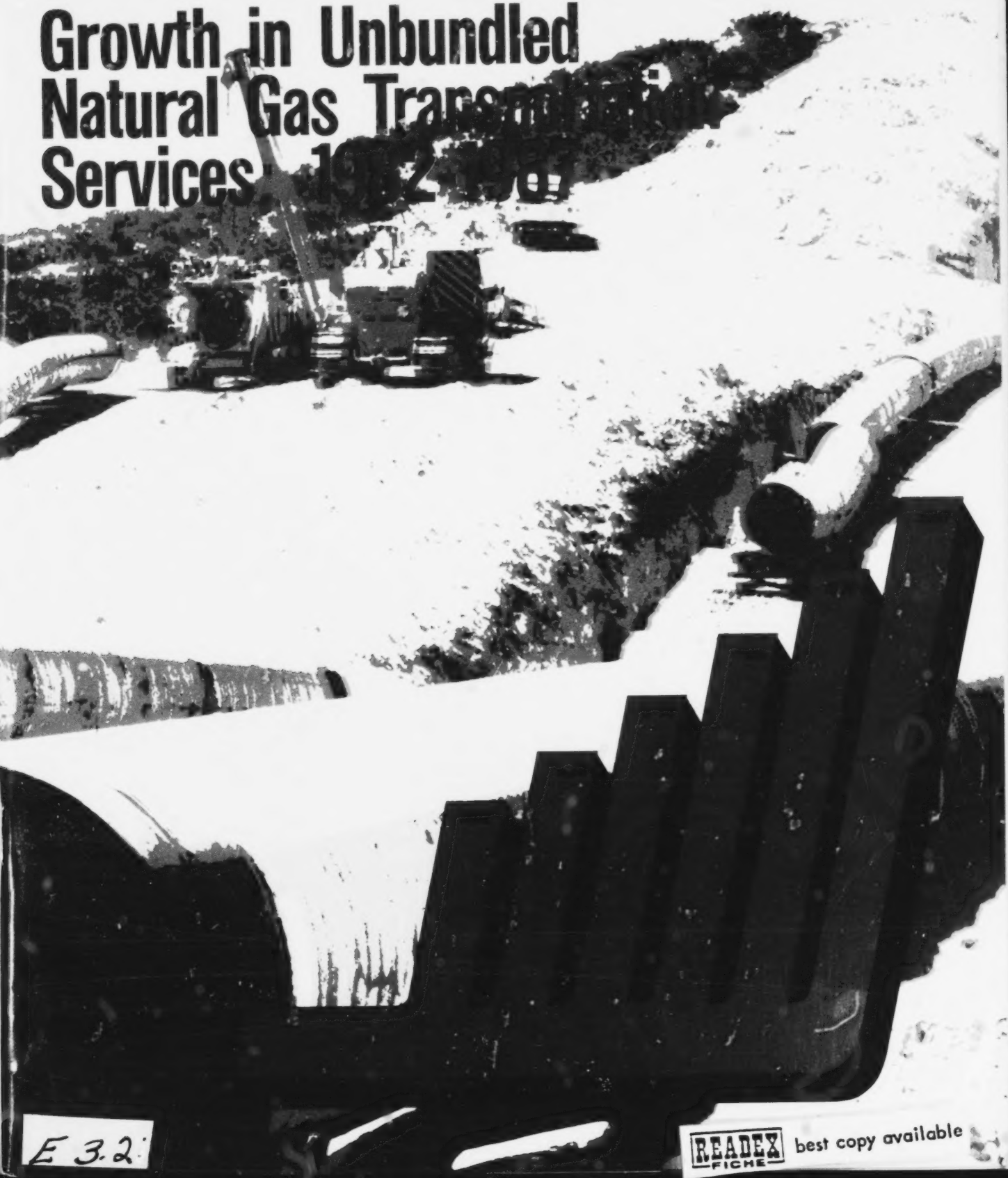

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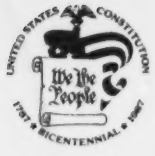

DOE/EIA-0525
Distribution Category UC-98

Growth in Unbundled Natural Gas Transportation Services: 1982-1987

Energy Information Administration
Office of Oil and Gas
U.S. Department of Energy
Washington, DC 20585

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Preface

The natural gas industry has undergone significant structural change since the passage of the Natural Gas Policy Act (NGPA) of 1978. Initially, the major impact of these changes was on the wellhead production market. Since 1982, however, major changes have affected downstream markets as well.

This publication examines the evolution of the natural gas transportation market since 1982. During this period, interstate pipeline companies shifted their emphasis from the wholesaling of natural gas to that of providing transportation services. This major restructuring of the marketplace may be attributed to a combination of factors including the softening of demand, partial deregulation of prices, competition from other energy sources, and the development of a natural gas surplus.

This report is intended to be of interest to analysts in the natural gas industry, State and Federal regulatory bodies, Congress, and the general public. It consists of four chapters and an appendix:

- Chapter 1 provides a brief history and background information on the transportation market and discusses the regulatory/economic environment in which market participants currently operate.
- Chapter 2 analyzes the overall trends in the transportation and sales segments of the interstate natural gas market since 1982. The chapter also presents a regional analysis of the extent to which large industrial and electric utility users have adopted transportation programs that encourage the movement away from the traditional sales and merchant orientation of pipelines.
- Chapter 3 provides more detailed analysis of the activities of 32 of the major interstate natural gas pipeline companies since 1982.
- Chapter 4 examines the competitive market forces that have nurtured the emergence of a transportation services sector, and highlights some recent initiatives intended to further competitive elements of this new market.
- The Appendix describes the data sources and methodologies underlying the data presented in this report.

The principal data source is the Federal Energy Regulatory Commission (FERC) Form 2, "Annual Report of Major Natural Gas Companies." Other sources include the FERC Form 11, "Natural Gas Pipeline Company Monthly Statement," and selected issues of two Energy Information Administration publications, *Natural Gas Monthly* and *Natural Gas Annual*.

Research and background materials concerning the recent history of the industry and regulatory trends were collected from several natural gas industry journals listed in the Bibliography. The time series of spot and long-term contract market price levels presented in Chapter 4 of the report is based on information from these sources.

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Executive Summary

Since 1982 and the emergence of a large spot market for natural gas, the demand for unbundled transportation, or carriage, capacity on the Nation's pipeline systems has increased dramatically. The spot market, and the transportation programs initiated to move this gas, created opportunities for large, price-sensitive consumers (such as industrial users and electric utilities) and local gas distributors (faced with ever increasing gas acquisition costs of pipeline system supplies) to gain access to lower-cost supplies of natural gas. This led the natural gas pipeline companies to adopt new marketing strategies and to implement unique service programs that adapted to the new market realities.

An examination of data for 20 major interstate pipeline companies (representing the traditional market) and the large industrial and electric utility consumers (representing the new natural gas marketplace) reveals the extent to which the natural gas market for transportation services has grown since 1982.

Transportation of natural gas refers simply to the movement of gas via pipeline from one point to another. In recent years, transporters of natural gas (interstate and intrastate pipelines) have fundamentally changed the way in which they provide transportation services to their customers.

- Traditionally, pipelines transported gas as part of a larger package of services (acquisition of the gas, storage near end-use markets, etc.) that they sold to customers. The price of the gas reflected the cost of acquiring the gas, plus the value of the transportation and other services, and a fair rate of return on their investment. In industry terminology, transportation services, and their associated costs, were included in the bundled services pipelines provided in the sale of natural gas.

- Since 1978, pipelines have increasingly transported gas as a separate (or unbundled) service. Many of the traditional customers of interstate pipelines have purchased increasing volumes of gas directly from producers (spot market), arranging their own gas acquisition instead of relying on the pipeline to do so. Customers pay the pipeline a fee for transporting the gas.

Much of the gas consumed in the U.S. market flows through interstate pipelines which transport the gas across State lines to consumers. Although interstate pipelines continue to provide their traditional, bundled sales services to customers, between 1982 and 1987 they have shipped an increasing share of their throughput under separate, unbundled transportation arrangements (Figure ES1). Over this time, transportation of pipeline-owned volumes declined by 60 percent while transportation of customer-owned volumes increased 2.8 times. This shift has been most pronounced since 1985, the last year in which deliveries of pipeline-owned volumes exceeded customer-owned volumes. In 1987, transportation as a separate service accounted for 67 percent of interstate gas movements, compared with only 22 percent in 1982.

The extent to which transportation has been unbundled from other pipeline services differs among the main types of customers served by interstate pipeline companies. In 1987, customer-owned volumes represented:

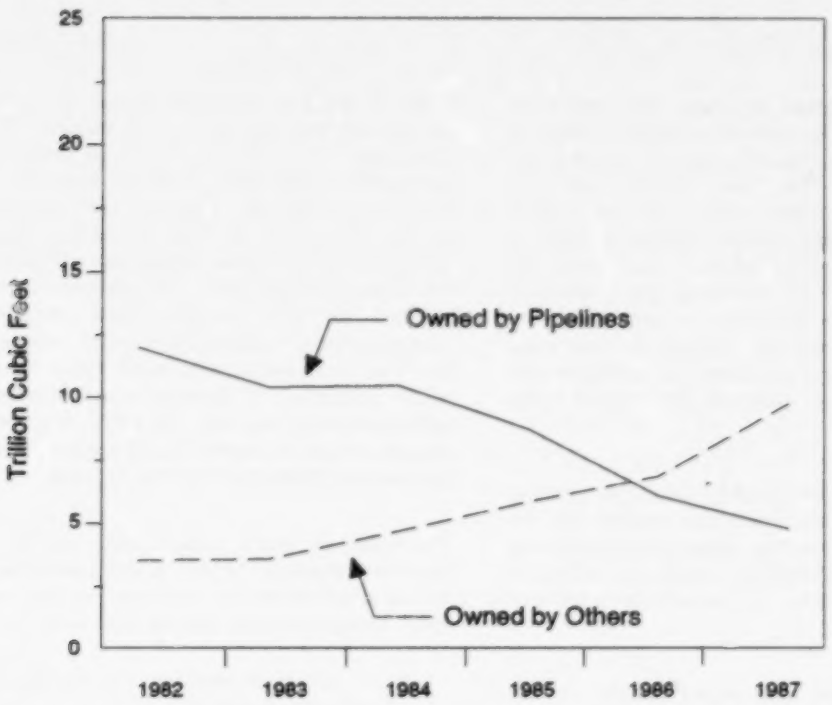
- 93 percent of interstate pipeline deliveries to end users and marketers

- 68 percent of interstate pipeline deliveries to other interstate pipeline companies

- 58 percent of interstate pipeline deliveries to intrastate pipeline companies and local distribution companies (LDC's).

A major reason for the increased use of unbundled transportation is the expansion of open-access transportation programs by interstate pipelines, which made spot-market gas more accessible to customers. The increase in unbundled transportation deliveries to end users and marketers is also partly due to the emerging role of natural gas marketers as intermediaries between producers and the traditional customers of interstate pipeline companies. In addition, industrial and electric utility customers have increasingly taken advantage of their negotiating position as large users to purchase gas directly from producers on the spot market and arrange separately for transportation. End users with the capability to switch to other fuels or with flexible production schedules are further able to take advantage of less expensive interruptible transportation service agreements.

Figure ES1. Summary of Annual Deliveries of Natural Gas by 20 Major Interstate Pipeline Companies, 1982 - 1987



Note: Offshore pipeline companies are not included.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

In addition to increasing deliveries directly from interstate pipeline companies, end users have also increased deliveries under unbundled transportation arrangements provided by intrastate pipelines and LDC's. As a proportion of the total gas delivered to industrial and electric utility customers (by interstate pipelines, intrastate pipelines, and LDC's), transportation program gas rose from 16 percent to 46 percent between 1982 and 1987.

Regionally, use of unbundled transportation arrangements by industrial and electric utility customers was originally heavily concentrated in the producing States of Texas, Oklahoma, and Louisiana (the southwestern United States). Use of unbundled transportation services began to expand in the industrial areas of the mid-Atlantic seaboard and midwestern States during the mid-1980's--somewhat later in western States.

In addition to differences among types of customers and regions of the country, use of unbundled transportation arrangements also varies among the major interstate pipeline companies. For example, companies that developed major take-or-pay problems (that is, could not sell the gas they were contractually obligated to buy from producers) in the early 1980's expanded their use of transportation agreements earlier than other interstate pipelines. Other differences parallel the regional differences in use of transportation programs by end users, with pipelines serving the Southwest producing areas and the industrial areas of the country shipping a larger share of their throughput as unbundled transportation volumes than other pipelines.

The separate transportation services market for natural gas developed in unison with the emergence of a dynamic spot market for natural gas. To a large extent, the decline in sales by interstate pipeline companies since 1982 reflects the degree to which the traditional system supply method of marketing natural gas has been replaced by transactions in a growing spot market, which accounted for about 42

percent of marketed U.S. production in 1987. (An incidental finding of this study is the lack of statistically valid data regarding the spot market. Samples used in existing spot market surveys are not necessarily representative of the entire market, because they are basically ad hoc surveys that have not been designed according to standard statistical sampling techniques.)

In recognition of the expanding spot market and the need to address pipeline difficulties relating to take-or-pay exposure and sales reductions, FERC issued Order 500 in 1987. Under Order 500, all customers of the participating pipeline were provided nondiscriminatory open access to unbundled transportation arrangements.

In 1988, some interstate pipelines were reporting declines in the use of open-access transportation services. Furthermore, in the aggregate, differences between short-term, spot-market and overall system supply prices appear to be narrowing. These two observations suggest: (1) there may be a limit on the extent to which transportation programs are used, and (2) the market may be approaching an equilibrium between spot and system supply.

1. Background and History

Introduction

Since the Natural Gas Policy Act of 1978 (NGPA), market forces and regulatory responses to these forces have combined to increase the competitiveness of natural gas markets in the United States. Most gas sold at the wellhead has become effectively price-decontrolled[1], spot-market transactions have become commonplace, and marketers have assumed a greater role as intermediaries between producers on the one hand and distributors and large end users on the other. These developments created a need for pipeline companies to separate, or unbundle, their transportation services from the package of services they traditionally provided as merchants selling gas. The restructuring of the traditional system for marketing gas from the wellhead to the consumer facilitated still further participation in new transportation programs and in the emerging spot market.

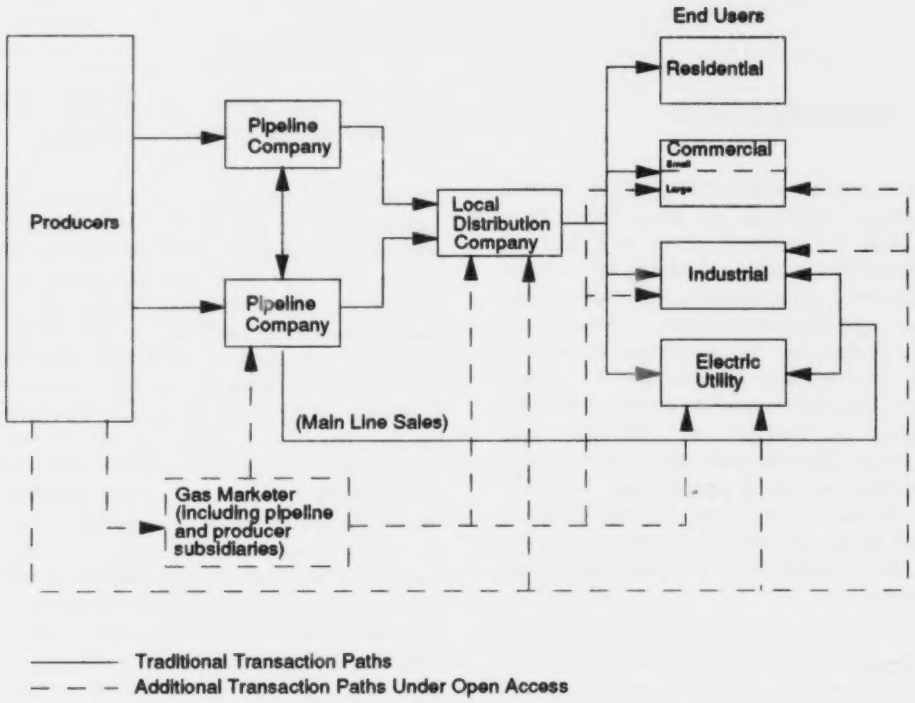
Transportation of natural gas (in its simplest terms, the movement of gas from one point to another) is the business of pipeline companies and local distribution companies (LDC's). Historically, the fundamental difference between the deliverers of natural gas and transporters of other commodities relates to ownership of the commodity transported. Transporters of most commodities are contract carriers--that is, they transport volumes owned by their customers for a fee. Natural gas transporters, however, traditionally provided transportation as one of several inclusive services offered to their customers as a package--that is, bundled. Pipeline companies purchased natural gas (usually at the wellhead and sometimes from another pipeline company), transported the gas through their system, and resold it (usually to a distributor and sometimes to another pipeline or directly to the end user). Similarly, the distribution company purchased gas from a long-distance transporter (interstate or intrastate pipeline) and shipped the gas through its system for resale to its customers. Thus, most gas transported in the United States has traditionally been what is commonly referred to as system supply--that is, owned by the natural gas pipelines and distribution companies that transported the commodity.

The marketing chain for natural gas traditionally included transportation as part of the sales transaction: producers sold the gas to pipelines that both sold and transported it to LDC's that both sold and transported it to end users (Figure 1). The traditional marketing chain included transactions among pipelines, as well as direct (main line) sales from pipelines to large end users that bypass the LDC. Such a market structure obscures an inherent difference, in terms of the number of market participants, between the sale of natural gas as a commodity and the transportation of the commodity to the end user. While sales of natural gas at the wellhead traditionally involve a limited number of buyers (pipelines) and a larger number of sellers (producers), the potential existed for a large number of buyers to enter the market, if pipelines became contract carriers instead of primarily buyers/sellers for their own system supply. As market conditions changed in the 1980's, pipelines did find it necessary to expand their provision of separate carriage services--that is, transportation of gas for others. As a result of the increasing numbers (and expanding participation) of new wellhead purchasers, the wellhead marketplace made a fairly easy transition from a regulated to a competitive market once wellhead price controls were removed in the 1980's.

Nevertheless, the significant capital investment required for the construction and operation of natural gas transportation systems necessarily limits the number of routes by which gas can (and is allowed to) move from producing fields to consuming markets. The number of transporters serving particular regional markets, together with limitations on receipt and delivery points by transporters, was initially believed to constrain the extent to which competition in the physical transportation of natural gas was possible. However, the marketing chain for natural gas began to diversify with the introduction of open-access transportation (discussed later in this chapter). These programs created additional marketing channels,

[1]Energy Information Administration. *Wellhead Purchases by Interstate Natural Gas Pipeline Companies Since the NGPA: Trends and Profiles.* DOE/EIA-510. Washington, DC, March 1988.

Figure 1. Principal Buyer/Seller Transaction Paths for Natural Gas Marketing



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Natural Gas Division.

depicted in Figure 1, between producers and the traditional pipeline customers (LDC's and large end users). As purchasers other than pipeline companies bought increasing volumes of short-term, price-negotiated gas directly from producers on an expanding spot market, demand for transportation services grew. Consequently, natural gas pipelines and LDC's began to separate, or unbundle, their gas sales and transportation services. By 1987, the volumes of customer-owned gas transported by many interstate pipeline companies exceeded the volumes owned by the pipelines and delivered to sales customers. This represents a fundamental change in the marketing infrastructure within the natural gas industry.

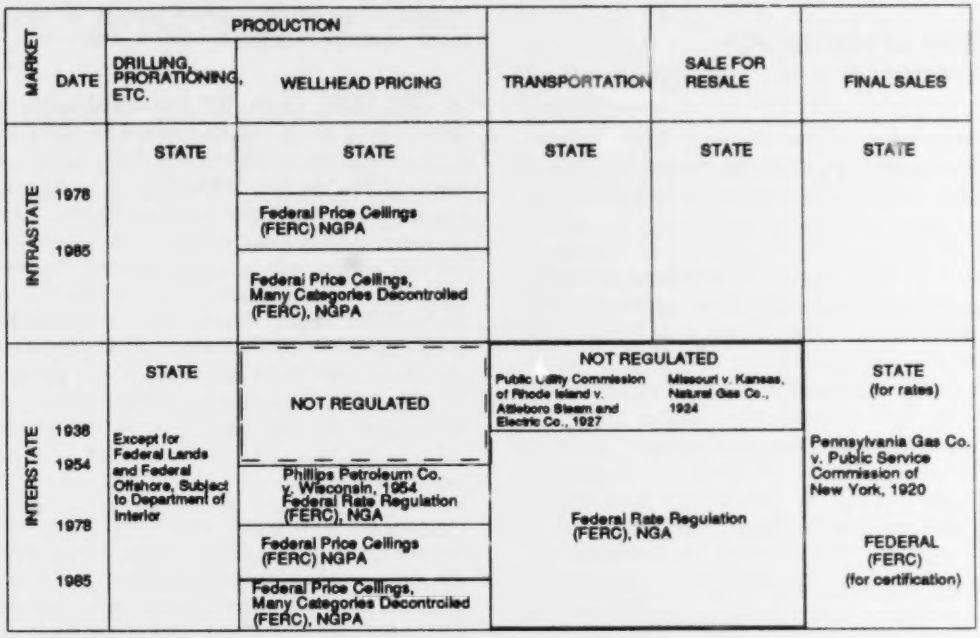
This report examines the development of a separate transportation market for natural gas during the 1980's. Its purpose is to provide data on this new feature of the natural gas market, and to examine issues related to its development, growth, and future direction. This chapter introduces the context in which data on the transportation market may be viewed. It provides background both on the regulatory environment of the natural gas market and the unbundling of natural gas transportation services. Chapters 2 and 3 present data documenting the development of a separate transportation market for natural gas. Chapter 4 examines the competitive forces and current issues that may shape the future direction of the transportation market.

The Regulatory Environment for Natural Gas

Background

The natural gas industry is regulated by both Federal and State authorities (Figure 2). For many years, virtually every aspect of the industry was regulated as a proprietary monopoly. Over the past 10 years, most aspects of gas sales at the wellhead have been effectively deregulated.

Figure 2. Regulatory Jurisdiction of the Natural Gas Industry



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Natural Gas Division.

Deregulation has had much less of an effect on transportation aspects of the industry.

State authority over gas pipeline and distribution systems was established early in the development of the industry. As the interstate gas transportation system grew at a record pace during the 1920's, a series of court decisions defined the scope of State authority over the industry:

- A State had full jurisdiction over purely intrastate transactions.
- The producing State had jurisdiction over production issues.
- The consuming State had the right to regulate final sales within the State, even if the gas had crossed State lines and even if the seller was an interstate pipeline.

These decisions left a "regulatory gap" of activities that could be regulated by neither producing nor consuming State:

- States could not regulate transmission of gas across State lines.
- States could not regulate the sale for resale of gas transported across State lines.

By the mid-1930's, some companies had shown an ability to exercise considerable market power over interstate natural gas markets. Generally, they were able to do so by taking advantage of the regulatory gaps that had opened up since the 1920's. To close these gaps, Congress passed the Natural Gas Act of 1938 (NGA) establishing Federal authority over interstate gas transportation and sales for resale. The NGA gave the Federal Power Commission (FPC)--later the Federal Energy Regulatory Commission (FERC)--jurisdiction over all activities that could not be regulated by the States.

The long-term influence of this regulatory history can be seen in the current jurisdictional distinctions for the regulation of different aspects of the natural gas industry. For example, FERC regulates interstate pipeline company

sales to LDC's (sales for resale) but not direct sales to end users.

Regulation of Interstate Transportation

Interstate transportation of gas has been fully regulated since the NGA under the clear jurisdiction of Federal authority. FERC power over transportation includes the rights to:

- Approve all new services to be offered, including transportation, storage, and resale services for each customer
- Set rates for all services offered
- Approve all new pipeline construction.

New Construction and New Services

Under traditional regulatory principles, the government's right to approve new construction and services arises from the need to protect ratepayers by assuring that investments are prudent and that new services do not jeopardize old commitments. Cost-based ratemaking usually allows a utility to earn a fair rate of return on its investment in new plant. Without regulatory scrutiny of all investments included in a utility's rate base, pipeline companies would have a considerable incentive to build many new projects regardless of their economic merits. Similar regulatory oversight is needed to ensure that a utility's offer to provide new service does not interfere with its ability to fulfill existing commitments. For example, a pipeline company might offer to provide more gas than it could actually deliver, gambling that peak demands for all customers would not coincide. At some point, however, peak demands may actually coincide, resulting in the need to curtail promised services, a condition that public regulation is supposed to prevent.

In the past few years, FERC has simplified the approval process for certain types of new construction and services. One way is through the use of blanket certificates. A blanket certificate approves a series of similar actions in one authorization. This eliminates the need for pipelines to obtain a separate certificate for each individual action included on the blanket certificate. FERC has used blanket certificates for authorizing both construction projects and transportation programs. For instance, construction of small additions to a pipeline may be authorized by a blanket certificate, provided the total cost does not exceed some threshold level. Similarly, pipeline companies may be allowed to transport gas for many different customers on the approval of a single blanket certificate.

In 1987, FERC Order 500 introduced optional expedited certificates (OEC's), another means by which the approval process may be simplified. An OEC speeds up FERC's approval process for construction projects, but does not exempt the projects from standard environmental reviews. In return, the company agrees to bear the majority of the risk of a project--that is, accept the market rate of return on the project, even if it falls below the fair rate of return the investment would otherwise be guaranteed under traditional regulation. Although seven pipelines have filed with FERC for OEC's as of the end of January 1989, only two of these applications had been finalized. Approval of the others is still pending due to protests and/or environmental issues.

For projects costing less than FERC's threshold level for blanket certificates, OEC's may appear relatively less attractive than blanket certificates. For example, a company that built a new pipeline at its own risk under an OEC may later find that a competitor has built a parallel line with normal FERC authorization. Depending on the market rate of return on the investment, the first project (built after obtaining an OEC) may earn more or less than the second. Assuming duplication of service leads to lower-than-planned throughput on both lines, the likelihood of the first project earning a higher rate is low. In any case, the guarantee of a fair rate of return under FERC authorization would make the second project more attractive to most investors than the first.

For larger projects, the choice between using an OEC or an individual certificate involves a tradeoff between the speed with which construction may get underway (barring environmental setbacks) and the guarantee of an attractive rate of return. Where market conditions indicate a strong potential for earning a high rate of return, the lack of a guaranteed rate of return is unlikely to discourage the use of an OEC.

Ratemaking

FERC (and its predecessor the FPC) has set rates for natural gas transportation for almost 50 years. In the ratemaking process, FERC approves pipeline tariffs that include (1) bundled transportation rates that are part of the

system-supply price of gas delivered to sales customers, and (2) unbundled transportation fees for deliveries of customer-owned gas. Tariffs typically include different rates for different classes of customers and types of service.

Ratemaking traditionally allows the pipeline company to recover its costs, which include a fair rate of return on its capital while protecting pipeline customers from paying excess costs that would enhance monopoly profits. States usually set rates for LDC's in the same way for the same reasons.

The fundamental question in cost-based rate designs is to decide how to recover fixed costs. For transporters, most of these costs are for their initial investment in the construction of the pipeline system. Such costs can be recovered in one of two ways. Customers could be billed either (1) a fixed charge regardless of how much gas the pipeline delivers (demand charge), or (2) a variable charge that depends on the quantity of gas delivered (commodity or volumetric charge). Use of a demand charge virtually guarantees that the pipeline will fully recover its fixed costs, since these costs are completely allocated among all firm service customers (interruptible customers generally are not required to pay demand charges). It also lowers the cost per additional unit of gas volume to customers, since they may receive additional volumes of gas from the pipeline without paying any more fixed costs. Recovery of fixed costs through a commodity charge, on the other hand, raises the cost per additional unit of gas volume and provides no guarantee that the pipeline will recover its entire fixed costs (but it also provides an opportunity for the pipeline to recover more than its actual fixed costs and thereby increase its return on investment).

In practice, the fixed-cost recovery methods approved by FERC combine demand and commodity charges. By altering the mix between demand and commodity charges, FERC can either encourage or discourage sales of natural gas, particularly to customers with fuel-switching capabilities. Adjusting the mix to include more fixed costs in the demand charge lowers the cost of each additional unit of gas volume and encourages sales. Alternatively, including more fixed costs in the commodity charge raises the cost of each additional unit of gas volume and discourages sales. Further, the recovery of fixed costs through a commodity charge spreads the recovery of these costs among both firm and interruptible customers.

The Unbundling of Natural Gas Transportation Services

Transportation as a Bundled Service

In their traditional role as merchants, pipelines and LDC's provide a full range of services to their system-sales customers. This includes everything from the initial acquisition of gas supplies to the ultimate delivery of the gas to the sales customer. Although the sales customers may view their transactions as simple purchases, the transporter's obligation to serve (a critical element in its status as a public utility) requires the provision of additional services to ensure deliveries to all firm customers without curtailment. Thus, in addition to acquiring the gas and physically shipping it from the wellhead to the burner-tip, natural gas transporters must provide some combination of (1) plant capacity to move the volumes of gas required on days of highest requirements (peak demand), and (2) storage capacity near end-use markets to meet requirements during the winter heating season.

A distinguishing characteristic common to the provision of physical shipment, capacity, and storage services is the dependence on a large physical plant (transmission lines, compressor stations, storage facilities/fields, etc.) with high fixed costs and often considerable economies of scale. These factors present major barriers to the entry of new participants in the traditional marketplace.

Traditional Transportation and Distribution Systems

The physical movement of gas is achieved through pipelines and distribution systems operated by interstate pipeline companies, intrastate pipeline companies, and LDC's. The high level of investment in physical plant required for these systems presents formidable barriers for new market entrants. Since it is both expensive and time-consuming to introduce new service, neither pipelines nor distribution companies are easily subject to competition from new market entrants. To the extent that sales customers have the capacity to substitute other fuels for natural gas, however, traditional transporters of natural gas face external competition from alternative sources of energy.

Long-haul transmission of natural gas from producing to consuming regions of the country is the primary function of interstate and intrastate pipeline companies. These pipelines provide gas to LDC's for distribution to end users, deliver gas directly to large users along the way, and also supply volumes of gas to one another.

The provision of long-haul transportation services to any given distributor or end user is highly concentrated in terms of the number of transporters. Many small distributors are served by only one pipeline. Although most large distributors do have physical access to more than one pipeline system, they seldom have a choice of more than a few potential pipeline suppliers. An earlier study that weighted distributors for size found that the average distributor had access to fewer than two sources of gas in 1985.[2]

Almost all distribution systems operate as franchised local monopolies. Although some end users (primarily large industrial and electric utility customers) may be able to obtain gas directly from a pipeline company (main line or direct sales), most residential and small commercial and industrial customers have no option but to obtain gas from the LDC for their service area.

Guarantee of Pipeline Capacity

One of the most important traditional services provided by natural gas pipelines and LDC's is a guarantee to firm contract customers to supply gas during periods of peak load. If this responsibility were neglected, some firm sales customers would face curtailments whenever the peak demands of enough customers coincided. In recent years, as pipelines have experienced declines in sales of system supply, many of them faced the opposite problem--unused capacity. Since increasing transportation of customer-owned gas has filled a significant portion of this excess capacity, the problem is neither a universal feature of the present market nor a likely characteristic of most future markets.

In general, regulatory policy seeks to minimize excess capacity under normal market conditions. The FERC, which oversees interstate pipeline rates and operations (including the offering of new services and capital construction), will approve of the construction of only enough new capacity to meet likely peak demand. The purpose of this regulatory policy is to protect ratepayers from subsidizing the overbuilding of capacity. Such a policy allows little scope for competition, except during off-peak periods, even in markets served by more than one pipeline.

Storage Services

Another way transporters of natural gas can fulfill their traditional responsibility of ensuring that peak demand will be met is through the use of gas storage facilities. Storing gas underground in suitable geological formations near ultimate markets reduces the required level of pipeline peaking capacity. Gas owned by the pipeline or distribution company is transported into storage during periods of slack demand and then withdrawn from storage and delivered to customers during periods of high demand (usually the winter). In these terms, storage can therefore be viewed as an adjunct to the transportation system.

Storage operations resemble other parts of the transportation system in that a large fixed investment is required, most customers are served by relatively few storage operators, and the amount of storage built is usually closely calibrated to seasonal demand. Market entry is somewhat more restricted, however, since the need for suitable geological formations limits the geographical locations in which storage facilities may be sited.

The Separation of Transportation Services from Sales

The evolution of the carriage of natural gas as a separate service provided a safety valve that allowed the regulated market to come to terms with fundamental imbalances of supply and demand. Although the gas curtailments of the 1970's provided the initial impetus for the creation of separate carriage services, transportation programs remain an increasingly important feature of the surplus markets of the 1980's. Table 1 lists and briefly describes the important features of major FERC Orders and programs initiated by the pipelines themselves--from FPC Order 533 (which established a limited transportation program for high-priority users) through Order 500 (which laid the

[2]Energy Information Administration, "Pipeline Mergers and their Potential Impact on Natural Gas Markets," *Natural Gas Monthly*, February 1986. DOE/EIA-0130(86/02). Washington, DC, April 1986.

groundwork for open-access programs as they operate today). Table 2 summarizes the three main authorities under which pipelines have been able to transport customer-owned gas since the NGA.

The transportation initiatives of the late 1970's were designed as temporary responses to fuel shortages. FERC Orders issued in response to gas curtailments of the mid-1970's authorized interstate pipelines to transport customer-owned gas obtained directly by those end users for whom the impact of a curtailment of system supply would be most serious. (In general, regulatory policy at this time also encouraged end users to switch to alternative fuels.) These transportation arrangements were initially limited to high-priority process, feedstock, and commercial users of natural gas (FPC Order 533, extended by FERC Order 2), and were later expanded to include essential agricultural users, schools, and hospitals (Order 27). Order 30 extended transportation programs to end users substituting natural gas for fuel oil, which was in short supply due to the petroleum market disruptions that followed the Iranian Revolution.

Meanwhile, the Natural Gas Policy Act of 1978 (NGPA) was passed by Congress to reduce regulatory distortions in the natural gas market and to increase the supply of natural gas. These objectives were to be met in the short term through the use of wellhead price incentives and over the long term through decontrol of wellhead pricing.[3] While the NGPA was aimed primarily at wellhead pricing, it also contains a provision, Section 311, which allowed the FERC to authorize interstate pipelines to transport gas on behalf of intrastate pipelines and LDC's. Under this expanded authority the FERC issued Part 284, subparts B and C, of its regulations, authorizing interstate and intrastate pipelines to provide NGPA Section 311 services on a self-implementing basis (that is, without prior Commission approval). FERC Order 46 implemented NGPA Section 311 and further facilitated the operation of these early transport programs by allowing interstate pipelines to transport gas on behalf of additional customer groups.

In the market environment that developed under the influence of the NGPA, natural gas prices rose and eventually demand fell off significantly. As a result, in 1983 a natural gas deliverability surplus began to develop and pipelines found that, in order to maintain economic load factors, new marketing methods were needed if customers, particularly large end users, were to be retained.

In addition, the threat of take-or-pay liabilities loomed as demand for system supply of natural gas diminished. To counter this emerging problem, a number of pipelines, operating within the guidelines of the aforementioned series of FERC Orders, moved to expand off-system sales to new users and to offer incentives to retain existing customers through brokerage packages that became known as Special Marketing Programs (SMP's). The intent of the SMP's, which sometimes included provisions for contract carriage of customer-owned gas, was to retain customers who otherwise might have switched to alternative fuels by providing access to less expensive, spot-market supplies. Since 1983, and until FERC Order 436 (see below) was issued, NGPA Section 311 authority was used extensively by the interstate pipelines as the primary method for transporting the bulk of customer-owned spot market gas.

FERC responded to these industry initiatives by introducing blanket certificates for both high-priority (Order 319) and non-priority users of natural gas (Order 234-B). Blanket certificates simplified the approval process for unbundled transportation arrangements by eliminating the need for pipelines to obtain a separate authorization from FERC for each transaction. Furthermore, Order 234-B in effect created a spot market for direct sales from producers, since blanket certificates for non-priority users (such as industrial boilers) were limited to 120 days.

Restricted access was a common feature of both SMP's and blanket certificates. FERC justified these restrictions on the basis that, by allowing pipelines to retain load, they spread fixed transportation costs over a broader range of customers and thereby led to lower rates for core customers.

In the 1985 Maryland People's Counsel cases, the Courts held that SMP's and blanket certificates illegally discriminated among customers.[4] The Courts found that minor savings from spreading fixed transportation costs among more customers were small when set against the large extra costs core customers paid by being denied equal access to market-priced gas at the wellhead. As a result of the Court's decision, the FERC recognized that if

[3]For a fuller discussion of the NGPA and its market impact in the 1980's, see the Energy Information Administration's *Wellhead Purchases by Interstate Natural Gas Pipelines since the NGPA: Trends and Profiles*. DOE/EIA-0510. Washington, DC, March 1988.

[4]Maryland People's Counsel v. FERC, 761 (DC Cir., 1985) and 768 F.2d 1354 (DC Cir., 1985).

Table 1. Developments Leading to Separation of Interstate Pipeline Functions as Transporter and Broker of Gas, 1975-1988

Date and Event	Description
8/28/75 FPC Order 533	Permitted interstate pipeline companies to transport gas bought by high priority users directly from producers of non-OCS gas. Order complemented Federal curtailments policy by ensuring independent supply sources for high priority users. Purchases limited to existing interstate customers for single 2-year term (to encourage switching to alternative fuels).
2/1/78 FERC Order 2	Extended Order 533 sales to allow sales extensions, make-up period for take-or-pay gas, use of brokers, and minimal regulation of intrastate pipelines that transport such gas. Customers still limited to high priority users (process, feedstock, commercial). In 1979, program extended to allow 5-year sales terms.
12/1/78 FERC Order 46	Allowed FERC to authorize the transportation of natural gas by interstate pipelines on behalf of intrastate pipelines, and vice versa.
4/27/79 FERC Order 27	Allowed essential agricultural users, schools, and hospitals to develop gas themselves or buy directly from producers. Term for purchases up to 5 years; for user-developed gas, term not to exceed 10 years. Interstate pipeline companies authorized to transport such gas.
5/13/79 FERC Order 30	Authorized direct sale of gas from producers to end users that would otherwise have burned fuel oil and transportation of such gas by interstate pipeline companies. Program to run for duration of fuel oil emergency. Allowed gas usage in boilers formerly discouraged under Powerplant and Industrial Fuel Use Act of 1978: Immediate oil shortage seen as more pressing than long-term gas supply. (Order 30 sales ended 11/3/83 under Order 234-B. Sales to low priority end users continued under blanket certificates in order to alleviate gas glut.)
11/79 Off-System Sales	Allowed interstate pipeline companies to sell gas directly to end users not normally served. Service to existing customers could not be impaired. Gas price must be higher than seller's average cost for Section 102 gas and seller's average load factor rate. Seller must demonstrate potential take-or-pay liability. Purchaser could not be part of another pipeline company's core market.
Special Marketing Programs (SMP's) -Transco 4/83 -Columbia 11/10/83 -Tenneco 11/20/83 -Panhandle/Trunkline 3/19/84 -Texas Eastern 6/29/84 -El Paso 8/24/84 -Various Producers 1983-85	Transco established first SMP as part of rate settlement. Under Industrial Sales Program, Transco purchased and set prices for gas. Producer-suppliers and eligible end users who wished to participate could then sell gas to or buy gas from the program. Transco's SMP expanded in June 1983 to include Contract Carriage Program (CCP). CCP allowed producers and end users to enter into direct sales agreements with the pipeline company acting as transporter (and Columbia occasionally as broker). Transco's two programs were models for all later SMP's, a few of which are listed here. As of April 1985 more than 30 SMP's had been approved. Two salient features of SMP's were that they (1) involved new (mostly Section 102(d)) gas dedicated to interstate commerce and therefore not eligible for blanket certificates or Order 30; and (2) discriminated among markets. The programs were aimed primarily (at first exclusively) at fuel-switchers, so captive customers could not purchase this market-priced gas.
8/83 Blanket Certificates to Transport Gas for High Priority Users FERC Order 319	Allowed interstate pipeline companies to use blanket certificates to transport gas for high priority end users (process, feedstock, commercial, essential agricultural users, schools, hospitals). Transporter does not need to obtain separate authorization for each transaction. Gas could be purchased from producers or other suppliers or be developed by end user. Terms up to 5 years for purchases, 10 years for own development. Program resembled those authorized by Orders 533, 2, and 27.
8/83 Blanket Certificates to Transport Gas for Non-Priority Users FERC Order 234-B	Allowed interstate pipeline companies to use blanket certificates to transport gas for users covered by Order 30, in effect creating a spot market of direct sales from producers and other intrastate suppliers to industrial boiler fuel users. Gas could be sold and transported for up to 120 days without prior approval. Longer agreement required prior notice and allowed for protest, but could be in effect for 120 days before process was complete. Program replaced Order 30 fuel oil displacement sales.
9/84 Extension of SMP's	Term of SMP's extended a year, to 10/31/85. Conditions substantially eased: Purchases could be made for gas originally priced at less than the system WACOG as long as the contract price remained above that of NGPA Section 109 gas; reporting requirements reduced; SMP gas could be used to serve up to 10 percent of the pipeline company's core market.
5/10/85 Maryland People's Counsel v. FERC F. 2nd No. 84-1019	Courts ruled SMP's in current form illegal because they discriminated against core customers. Courts rejected arguments that SMP's would eventually help core customers on grounds that no strong case had been made that such benefits would outweigh those arising from increased wellhead price competition if all buyers were eligible to participate.
5/10/85 Maryland People's Counsel v. FERC F. 2nd No. 84-1090	Courts ruled blanket certificate transportation for end users illegal as then conducted because it discriminated against pipeline company core customers. The two Maryland cases in effect outlawed any spot market not open to all buyers. Also showed that FERC must consider antitrust issues in designing programs.
10/85 FERC Order 436	Issued in response to Maryland People's Counsel cases, allowed interstate pipelines to become "open-access" transporters for gas bought directly from producers. For open-access pipelines, Order would separate pipelines' merchant and transportation functions.
10/29/85 Tenneco et al. v. FERC, Docket CI85-633-000	FERC denied 32 requests to continue SMP's beyond 10/31/85. However, FERC did grant petitioners authority to abandon and resell contractually committed volumes provided that contractually committed gas had ceiling price higher than that of Section 107 gas. Applicants urged to use transportation mechanisms specified in Order 436.
5/23/87 Associated Gas Distributors et al. v FERC, No. 85-1811 et al.	U.S. Court of Appeals for D.C. Circuit remanded Order 436. Strongly affirmed open-access transportation and rate conditions of Order, but reversed and remanded nondiscriminatory access and Contract Demand (CD) reduction/conversion on grounds they aggravate pipeline take-or-pay problems.
8/7/87 FERC Order 500	Interim response to Court's vacating Order 436. Readopted 436, with modifications including: (1) producers must offer to credit gas transported by pipeline against pipeline's take-or-pay liability; (2) pipelines may seek to recover take-or-pay buyout/buydown costs associated with past liability. Also allows pipelines to design future gas supply charges to prevent further take-or-pay liability; and eliminates CD reduction provision of Order 436.
2/5/88 FERC Order 490	Allowed sellers and purchasers to automatically abandon all first sales of natural gas under Section 7(b) of the Natural Gas Act, upon 30 days' notice, where the underlying contract has either (1) expired, or (2) been terminated or modified by mutual agreement of the parties. Promoted open-access transportation by making possession of Order 436/500 certificate a prerequisite for pipelines to abandon purchases unilaterally.

Source: Federal Energy Regulatory Commission, Office of Public Information, Washington, D.C.

Table 2. Authorities Under Which Interstate Pipeline Companies May ProvideTransportation Services

	Authority		
	NGA Section 7(c)	NGPA Section 311	FERC Orders 436/500
Available since:	1938	1979	1985/1987
Authorizes transportation for:	All customers	Interstate pipelines, Intrastate pipelines, and LDC's only	All customers
Authorized by:	Individual certificates	2-year certificates	Blanket certificates
Implementation requires:	Prior FERC approval	No prior FERC approval; self implementing provided gas is used only for system supply of customer	FERC approval, subject to provision of non-discriminatory open-access service

Source: Natural Gas Act of 1938, Natural Gas Policy Act of 1978, Federal Energy Regulatory Commission Orders 436/500.

the problems of the current natural gas marketplace were to be effectively addressed, it was essential to promulgate a more definitive program covering the specifics of open-access transportation.

Open Access Under FERC Orders 436 and 500

Order 436, issued in late 1985, provided the basic framework for the evolving transportation market. Its key provisions allowed pipelines to become open-access transporters for gas bought directly from producers by all classes of customers. In effect, the Order institutionalized the separation of the merchant and transportation functions of interstate pipelines.

Order 436 faced almost immediate legal challenges. Although it was ultimately remanded in 1987, its key provisions relating to open-access transportation and rate conditions were strongly affirmed. Order 500 replaced Order 436 in August 1987--retaining most of the key features of Order 436, but modifying some provisions to take account of the Court's decision (see Table 1 for details). In its most important provisions relating to transportation, Order 500:

- Offers blanket certificates for transportation of gas provided that the pipeline company agrees to allow all customers access to the service. The specific definition of open access is still somewhat unclear, however, and disputes about the priority of claims on a pipeline's capacity can be expected to continue for some time to come. But the principle of open access in return for a blanket certificate has remained in place.

- Allows pipelines to discount their rates selectively to compete in a given market. Rates may be discounted to the variable cost of moving the gas. Since most pipeline costs are fixed, the discretion in setting rates can be great. The justification for selective discounting is essentially that used for SMP's: retaining customers allows at least some recovery of fixed costs and lowers rates to core customers.

- Allows pipeline customers to convert their contract demand volumes to firm transportation volumes over a period of five years.

Most of the major pipeline companies, as well as many of the smaller companies, have now become open-access transporters under Order 500 (Table 3). Others continue to transport gas under Section 311 of the NGPA (which is subject to the open-access provisions, but no others, of Order 500). In addition, pipelines still have the option to transport gas under individual (not blanket) certificates, authorized under Section 7(c) of the NGA, which are not subject to open-access rules.

Summary

Natural gas transportation does not readily lend itself to a competitive market. Transportation systems require immense investment in physical plant, which effectively limits market entry and creates high fixed costs. This consideration implies the dual need to maximize capacity utilization and minimize duplication of service routes. The combination of market and regulatory factors encouraging the severing of transportation from brokerage functions has created the foundation for movement in the direction of greater competition for transportation services. Many interstate pipeline companies have become open-access transporters under FERC Order 500, and intrastate pipelines and LDC's also provide separate transportation services under the regulatory auspices of their respective State utility commissions. The following two chapters examine the available data to measure the size and document the growth of these new natural gas markets.

Table 3. Status of Selected Interstate Pipeline Companies as Open-Access Transporters, January 1989

Pipeline Company	Application Date	FERC Decision Date	Current Status
Major Companies			
ANR Pipeline Co.	6/28/88	7/25/88	Subject to outcome of rate proceeding
Colorado Interstate Gas Co.	6/25/86	3/29/88	Order 500 transporter
Columbia Gas Transmission	12/13/85	2/25/86	Order 500 transporter
CNG Transmission Corp.	2/10/86	2/13/87	Order 500 transporter
El Paso Natural Gas Co.	6/1/88	11/2/88	Order 500 transporter
Enron Corp.	4/11/86	12/22/86	Order 500 transporter
Florida Gas Transmission	1/13/89	--	Application pending
KN Energy Inc.	--	--	No open access transportation
Natural Gas PL of America	6/23/86	5/8/87	Order 500 transporter
Northwest Pipeline Corp.	6/20/86	1/19/88	Filed for rehearing
Panhandle Eastern Pipe Line Co.	6/24/86	11/20/87	Order 500 transporter
Southern Natural Gas Co.	3/28/88	5/8/88	Order 500 transporter
Tenneco Inc.	12/8/86	6/18/87	Order 500 transporter
Texas Eastern Transmission	3/13/86	9/29/88	Order 500 transporter
Texas Gas Transmission Co.	8/16/88	9/15/88	Order 500 transporter
Transco Inc.	4/1/88	4/29/88	Order 500 transporter
Transwestern Gas Pipeline	12/17/87	3/1/88	Order 500 transporter
Trunkline Gas Co.	6/24/86	4/30/87	Order 500 transporter
United Gas Pipeline Co.	10/2/87	1/15/88	Order 500 transporter
Williams Natural Gas Co.	1/4/88	5/10/88	Order 500 transporter
Other Companies			
Arkla Energy Resources	9/19/88	12/22/88	Pending rehearing, NGPA Section 311
Columbia Gulf Transmission	12/13/85	2/25/86	Order 500 transporter
High Island Offshore System	--	--	Transporting under NGPA Section 311
Northern Border Pipeline	5/19/86	4/30/87	Order 500 transporter
Overthrust Pipeline Co.	1/16/87	7/19/88	Vacated 11/3/88; company objected to minimum revenue crediting mechanism
Pacific Gas Transmission	1/13/87	8/21/87	Rejected by company
Questar Pipeline Co.	8/1/88	9/16/88	Order 500 transporter
Sea Robin Pipeline Co.	9/20/88	10/21/88	Order 500 transporter
Stingray Pipeline Co.	3/1/88	--	
Tarpon Transmission Co.	11/23/87	12/29/87	Order 500 transporter
Trailblazer Pipeline Co.	9/12/86	4/30/87	Vacated 4/5/88; company objected to minimum revenue crediting mechanism
U-T Offshore System	--	--	Transporting under NGPA Section 311
Wyoming Interstate Co. Ltd.	--	--	Transporting under NGPA Section 311

-- = Not applicable.
Note: FERC Order 500 superseded FERC Order 436 on August 7, 1987.
Source: Federal Energy Regulatory Commission, Office of Pipeline and Producer Regulation.

2. Overall Trends in Transportation Programs

With the implementation of interstate open access by the Federal Energy Regulatory Commission (FERC) and adjustments in State guidelines regulating intrastate pipelines and local distribution companies (LDC's), large quantities of gas now flow outside the system supply of traditional transporters and distributors of natural gas. During 1987, the major interstate pipeline companies transported a greater volume of gas owned by their customers than that owned by the pipelines themselves for sale to their system-supply customers, a reversal of the relative importance of these two aspects of their business in 1982. Also during 1987, for the first time ever, LDC's obtained greater volumes of gas under transportation program arrangements (spot-market purchases) than from interstate pipeline system supply. In turn, LDC's and intrastate pipeline companies (both regulated by State utility commissions) joined interstate pipelines in transporting increasing volumes of gas owned by industrial and electric utility customers, the two largest end-user classes of customers participating in transportation programs.

A separate transportation market for natural gas developed in tandem with the fundamental market restructuring that occurred during the 1980's. As prices of natural gas at the wellhead declined, and the wellhead segment of the market became more competitive, purchasers other than pipelines (LDC's, electric utilities, large industrial and commercial consumers, and marketers) sought and gained access to newly available sources of supply through the growing spot market. Unbundled transportation services and open-access arrangements have provided the means by which pipelines (especially the interstates) have continued to maintain these buyers as customers, even though they may no longer purchase their gas totally from pipeline system supply. In almost all respects, therefore, the transportation market developed out of economic necessity for the participants, with FERC playing a more reactive than a proactive role. Thus, the mechanisms devised by FERC (such as open access) represented attempts to incorporate the changes the market itself already was bringing about (while seeking to maintain a balance of interests and establish requirements for nondiscrimination) rather than initiatives to change the direction of the market.

Current natural gas marketing is a mix of the traditional (sales from pipeline system supply) and the nontraditional (separate transportation services for customer-owned gas purchased on the spot market). While the traditional marketing of system supply by pipelines and LDC's still plays a major role in the functioning of the marketplace, it is the nontraditional market that is of primary interest in this analysis.

The current spot market for natural gas is generally acknowledged to be large. However, developing an accurate measure of the size of this market is difficult. Little data pertaining to the purchasing of gas in the spot market exist or are reported, largely because of the very nature, relative newness, and unique brokerage arrangements that characterize this market. Nevertheless, the examination of data that report deliveries of what essentially are volumes of gas purchased on the spot market--that is, the reporting of data for "transportation of gas on behalf of others"--provides an alternative approach for estimating these volumes.

This chapter examines, both quantitatively and qualitatively, the growth of a separate and unbundled transportation market for natural gas. The first part of this chapter examines the concept of the spot market and provides an estimate of the size of this market in 1987. The second part of the chapter measures the growth of unbundled transportation as reflected in the interstate pipeline transportation sector for 20 of the major companies as a group (see Appendix for a list of what companies are included and an explanation of how they were selected). Specifically, it examines how these 20 major companies have fundamentally modified the mix in their annual throughput between sales (pipeline-owned volumes) and transportation (customer-owned volumes) for their major types of customers. Lastly, it presents a measure of this growth on a State and regional basis in terms of deliveries to major types of end users. Specifically, it looks at the increasing importance of customer-owned supply, shipped under transportation programs, in the total volumes of deliveries to two types of end users--large industrial customers and electric utilities.

Spot Market

One of the most important developments related to the evolution of a separate transportation services sector was the increasing use of spot-market transactions in the wellhead market. In many respects, therefore, the spot market provided a catalyst for the growth of the unbundled transportation market. Given the importance of this relationship, it is helpful to examine the nature of the natural gas spot market and its contribution to the restructuring that occurred in the marketplace.

The spot market defies precise measurement because it is both difficult to define and difficult to quantify. In general, spot-market gas is characterized by the following: (1) the purchase-contract term is short, usually less than 18 months; (2) delivery is on a best-efforts, nonguaranteed basis; (3) price is negotiated and reflects current market conditions; and (4) transportation is arranged separately from the sale, and is usually provided on an interruptible basis.

The spot market that developed in 1983 was made up of gas that the pipelines brokered between producers (whose gas the pipelines either could not or would not take) and large end users (system-supply purchasers who were about to switch out of natural gas unless they could lower their gas acquisition costs). This gas consisted primarily of new gas as defined in the Natural Gas Policy Act of 1978 (NGPA), since the NGPA did not require prior FERC approval for the abandonment of new gas covered by interstate contracts. Less expensive old-gas supplies generally were not included for two reasons: (1) they were reserved for core customers, and (2) they were governed by the Natural Gas Act of 1938 (NGA) and FERC regulations that required full abandonment procedures before a contract could be abrogated.

As the market conditions that brought about this infant spot market persisted throughout the mid-1980's, the spot market grew both in size and in the types of gas available to purchasers. Today the spot market still includes the original, refused takes of the pipeline merchants mentioned above as well as the following additional sources of supply.

- New-gas supplies (post-NGPA) for which there are no long-term contract commitments. Producers generally sell this type of gas on the spot market if they are unable to find a system-supply buyer, or if they elect to defer putting the gas under a long-term contract in the belief that prices for natural gas will rise in the future.

- Old-gas supplies (pre-NGPA) previously committed to the interstate market under long-term contracts that have been abandoned by agreement of both parties (and with FERC approval).

- Gas supplies available as a result of a pipeline exercising its market-out clause in a contract to purchase gas from a producer. Market-out clauses usually allow the pipeline to offer a price below that specified in the contract, and permit the producer to sell the gas elsewhere if a higher price could be attained.

- Canadian gas that is not under long-term contract to U.S. pipelines. This gas is, for all practical purposes, available to the U.S. spot market. Much of the gas flowing out of Canada into the United States [5] is either handled by gas marketers/brokers or purchased by U.S. pipelines under short-term agreements.

In practice, the spot market actually reflects the actions of a diverse set of participants who have a variety of options open to them regarding the terms of purchase and methods for delivery.

- Some pipelines purchase spot-market gas for their system-supply portfolios in an effort to lower their overall weighted average system cost of purchased gas.

- LDC's have become significant spot-market purchasers and have entered into transportation agreements with the upstream transporters (interstate and intrastate pipelines), as well as with other LDC's.

- Marketers buy aggregations of gas on the spot market to resell to LDC's or large end users. In addition, some marketers do not actually wholesale gas, but instead confine their services to bringing the buyer and seller together and helping to negotiate arrangements for the transportation of

[5]Energy Information Administration, "U.S. Imports and Exports of Natural Gas," *Natural Gas Monthly*, July 1988. DOE/EIA-0130(88/07). Washington, DC, September 1988.

the gas to specific delivery points on behalf of the buyer.

- Industrial and electric utility customers (as well as some large commercial firms) have purchased gas on the spot market and have obtained transportation for this gas via upstream transporters.

Unfortunately, transportation program data are incomplete, since data are not available on all actual transactions among all potential clients. Data are available, and essentially complete, for transactions covering (1) interstate pipeline deliveries to other interstates, LDC's, and end users; (2) LDC deliveries to end users; and (3) deliveries to LDC's by intrastate pipelines or other LDC's. This coverage represents an estimated 90 percent of all deliveries. Data are not available on LDC transportation deliveries on behalf of another LDC or an intrastate pipeline, spot market purchases by interstate pipeline companies for their own system supply, or (prior to 1987) transportation program deliveries to commercial customers.

While it is impossible to compute an actual spot-market size, a reasonable estimate of its 1987 magnitude can be derived from data on reported deliveries of customer-owned gas in several transportation categories (Table 4). First, consider the total volume of gas reported as moving under all transportation agreements. This grew from 1.8 trillion cubic feet (Tcf) in 1982 to 8.9 Tcf in 1987. These levels represent gas shipped under both long- and short-term transportation agreements (spot-market purchases are typically moved under short-term agreements, although they may be shipped under existing long-term contracts).

In 1982 almost all transport program gas moved under long-term agreements (an estimated 1.6 Tcf) with only a limited amount of intrastate spot gas and interstate emergency and off-system sales moving under short-term agreements (an estimated 0.2 Tcf or about 10 percent of all customer-owned gas). Based upon limited data available from those interstate pipelines that identified the type of agreement or tariff classification covering transportation program transactions in the "Annual Report of Major Natural Gas Companies" to the FERC, the trend since 1982 has been toward the increased use of short-term transportation agreements, with only some growth in volumes of gas moved via long-term agreements. Assuming that approximately 2.4 Tcf (out of the total 1987 transportation program market segment of 8.9 Tcf) was transported under long-term agreements in 1987 (based on an estimated 50 percent allowance for growth from the 1982 level), this would leave about 6.5 Tcf moving under short-term agreements--our surrogate for a 1987 spot market estimate (Table 4). This market level represented about 42 percent of total deliveries to ultimate consumers in 1987. This is a fairly conservative estimate of the size of the spot market (estimates based on spot market purchases at the wellhead range as high as 7.7 Tcf for 1987).

As the spread between the price levels for short-term, spot-market gas and system-supply gas narrows, the size of the spot market should level off, if not decline somewhat. During the past several years interstate pipelines have managed to lower their acquisition cost for system supplies through pressure on suppliers and aggressive purchasing strategies.[6] Between 1987 and 1988, the average pipeline system-supply price continued to decline while spot-market prices increased. Since system supplies offer end users a degree of insurance not available in the spot market, end users are and will continue to seek out and maintain purchase levels from both markets that, in the aggregate, will give them the least-cost mix consistent with desired levels of supply security.

Interstate Market

The following analysis of trends in transportation programs in the interstate system is based primarily on data for 20 of the major interstate pipelines (as measured by total sales and transportation throughput volumes in 1987). These 20 major pipeline companies accounted for about 52 percent of all gas purchased in 1982 (88 percent of all gas purchased for the interstate market, Table 4). By 1987, the total gas volumes purchased by these 20 companies had decreased significantly from the 1982 levels, but total throughput was not greatly affected given the extent to which transportation of customer-owned volumes was substituted for system supplies.

Confining the analysis of the interstate market to the 20 major pipeline companies minimized the degree of doublecounting of overall system throughput. Many of the

[6]Based on price levels compiled from data supplied by 46 major interstate pipeline companies on the Federal Energy Regulatory Commission Form 11, "Natural Gas Pipeline Company Monthly Statement" through the third quarter of 1988. Also, see Chapter 4.

Table 4. Estimated Natural Gas Market Sizes and Representative Proportions
(Volume in Trillion Cubic Feet)

Category	1982		1987	
	Volume	Percent	Volume	Percent
	Wellhead and Plant Purchases			
Interstate Market				
Major 20 Pipeline Companies	9.6	52	4.3	25
All Others	1.3	7	2.3	13
Total	10.9	59	6.6	38
Non-Interstate Buyers	7.6	41	10.7	62
Total Lower 48 States	18.5	100	17.3	100
	Net Deliveries to Ultimate End Users[a]			
Interstate Pipeline Companies				
Transported for Others[bc]	0.9	6	7.9	51
Sales[d]	9.6	59	4.3	28
Total Net Throughput	10.5	64	12.2	79
Non-Interstate Deliveries	5.8	36	3.3	21
Total	16.3	100	15.5	100
	Deliveries of Customer-Owned Volumes			
Moved Under Short- or Long-Term Transportation Programs[e]				
For LDC's and Intrastate Pipelines[f]	0.4	22	4.9	55
For Industrial Users and Electric Utilities[g]	1.4	78	4.0	45
Total	1.8	100	8.9	100
Less Estimated Long-Term Transport Programs	1.6	10[h]	2.4	15[h]
Estimated Spot Market	0.2	1[h]	6.5	42[h]

[a]Total volume delivered does not agree with the total volume purchased mainly because of reported line losses and volumes expended for lease/plant overhead and pipeline fuel. In 1987 these volumes were 0.4, 1.14, and 0.52 trillion cubic feet, respectively.
[b]Includes spot market deliveries.
[c]Transportation volumes have been adjusted to compensate for (but not eliminate totally) double or triple counting of gas handled by several pipelines in the delivery chain.
[d]Sales for resale volumes to other interstate pipelines will also be reflected in volumes delivered to LDC's, since the LDC usually is the last segment in the marketing chain. These sales levels have been adjusted to eliminate this double counting of sales volumes.
[e]The reporting on transported gas is undifferentiated between long- and short-term contract basis.
[f]As reported by the 20 major interstate pipelines.
[g]Reflects all gas transported on behalf of these customer types.
[h]Expressed as a percent of Net Deliveries to Ultimate End Users.
Source: Federal Energy Regulatory Commission, Form 11, "Natural Gas Pipeline Company Monthly Statement." Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies." Energy Information Administration, *Natural Gas Annual 1982-1987.*

interstate pipeline companies not included in this group purchase their gas from, or transport gas on behalf of, these same 20 major pipeline companies; by excluding these other pipelines, it is possible to avoid this type of over-reporting. In addition, since some of the pipelines that have been excluded traditionally serve mainly as feeder lines to other pipelines (for example, transportation of volumes from offshore), the extent of the shifts from system to off-system purchasing as a marketing strategy may be more readily examined by limiting the analysis to the selected group of pipelines.

The interstate market for natural gas consists of gas that is transported across State lines to consuming regions. The focal point for activity in the interstate market is the

system of interstate pipeline companies that sell gas to, and transport gas for, other interstate transporters, noninterstate transporters, local distributors, end users, and a relatively new group of market participants who act as intermediaries between the other participants--gas marketers (or brokers).

Recent market and regulatory developments have encouraged the separation of sales and transportation activities in the interstate market. Transactions in this marketplace may be grouped into three major categories, or marketing segments:

- Sales to, and transportation for, other interstate pipeline companies
- Sales to, and transportation for, LDC's and intrastate pipelines
- Sales to, and transportation for, end users and gas marketers.

Some interstate pipeline companies have always been primarily gas transporters, with little or no sales activities. For example, most of the joint venture offshore companies in the Gulf of Mexico (High Island Offshore System, Stingray Pipeline Company, and UT Offshore System) exist for the sole purpose of bringing gas to shore for receipt by other pipelines. A company such as Columbia Gulf Transmission, for instance, serves primarily as a transporter of gas from the Southwest to Columbia Gas Transmission, its parent company and a major interstate transporter of natural gas to the East Coast. In addition, several new pipelines that opened during the 1980's have operated primarily as transporters from the Rocky Mountains or from Canadian markets to consuming regions. Because a primary purpose of this study is to analyze how pipelines have responded to market and regulatory changes in terms of their relative mix of sales versus transportation programs, these companies have been excluded from the data and discussion presented below. Data on these companies will be presented separately in Chapter 3.

Overall Trends

Since 1982, the 20 major interstate pipeline companies as a group have significantly reduced the extent to which they continue to play their traditional role as brokers/transporters of natural gas. Data on both absolute and relative volumes of natural gas owned and delivered by the pipelines for sale to their customers ("sales"), compared to the volumes of customer-owned gas they transport as an unbundled service ("transportation"), indicate the magnitude of this changing role. During 1982, the 20 major pipelines shipped 11.9 Tcf of natural gas to their sales customers, and transported an additional 3.5 Tcf for others (Table 5). Sales volumes thus exceeded transportation program volumes by a ratio of 3.5 to 1. By 1987, transportation program volumes exceeded sales volumes by a ratio of 2 to 1. Between 1982 and 1987, sales volumes declined by 60 percent while transportation program volumes increased 2.8 times. This shift in the primary function of the major pipeline companies as a group has been most pronounced since 1985, the last year in which sales volumes exceeded transportation program volumes.

While the total volume of system throughput (sales plus transportation program gas, excluding exchange gas and pipeline use gas) has fallen by 6 percent since 1982, much of this decline actually is due to a significant and rapid reduction in volumes sold to other interstate pipelines (minus 75 percent) and transported for other interstate pipelines (minus 31 percent) during this period, as each company tried to avoid takes of high-priced system-supply gas. If volumes sold to and transported for other interstate pipelines are excluded from their total throughput, the 20 major interstate pipeline companies actually shipped 27 percent more gas in 1987 than in 1982.

Sales and Transportation Programs Among Interstate Pipelines

Interstate pipeline companies sell natural gas to, and transport natural gas for, other interstate pipelines for subsequent shipping to LDC's, intrastate pipelines, or end users. Because these volumes flow from one interstate pipeline to another, they may be ignored in estimating the total amount of gas shipped through the interstate system. These transactions are relevant, however, as an indication of the orientation of interstate pipeline activities, and in particular the significant reorientation of these activities that has occurred since 1982.

Both the level of gas purchased by interstate pipelines from other interstate pipelines and the amount transported on behalf of interstates by other interstates dropped significantly between 1982 and 1987 (Table 5). Pipelines reduced their purchases from other pipelines as part of an overall strategy to lower their costs of acquiring gas for their system supplies. Essentially, this strategy entailed

Table 5. Natural Gas Sales and Transportation Program Deliveries by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Type	1982		1983		1984		1985		1986		1987		Percent Change 1982-1987	Percent Change 1985-1987
	Volume	Percent	Volume	Percent	Volume	Percent	Volume	Percent	Volume	Percent	Volume	Percent		
Transported for:														
Interstate Pipelines[b]	2,730	18	2,419	17	2,663	18	2,546	18	2,202	17	1,878	13	-31	-26
LDCs and Intrastate Pipelines	386	3	733	5	1,246	8	2,099	15	3,147	25	4,940	34	[c]	135
End Users and Marketers	338	2	359	3	701	5	1,129	8	1,428	11	2,870	20	750	154
Total Transported	3,454	22	3,511	25	4,609	31	5,774	40	6,776	53	9,688	67	181	68
Sales to:														
Interstate Pipelines[b]	3,501	23	2,763	20	2,652	18	1,741	12	1,126	9	891	6	-75	-49
LDCs and Intrastate Pipelines	7,945	52	7,208	52	7,305	49	6,537	45	4,620	36	3,611	25	-55	-45
End Users	491	3	371	3	438	3	391	3	270	2	228	2	-54	-42
Total Sales	11,937	78	10,342	75	10,395	69	8,669	60	6,016	47	4,731	33	-60	-45
Total Throughput	15,391	100	13,854	100	15,004	100	14,442	100	12,793	100	14,419	100	-6	0
Estimated Net Deliveries[d]	110,457	--	9,894	--	10,887	--	11,107	--	10,262	--	12,228	--	17	10

[a]Transportation volumes do not include exchange and compression gas transactions.
[b]Transportation for other interstate pipelines will also be reflected in the total sales levels since any volumes transported for a given pipeline will eventually be sold by that pipeline and be reported as such under sales.
[c]Percent change greater than 1000.
[d]Net after transportation and sales transactions among the inclusive major 20 interstate pipelines were backed out of overall system throughput. The procedure minimizes but does not totally eliminate double counting of volumes moving through the delivery chain.
-- = Not applicable
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

cutting back purchases from the most expensive sources of supply--among them their interstate pipeline suppliers. Volumes transported for other interstate pipelines declined mainly because of the pipelines' shift in emphasis from brokerage to transportation of customer-owned gas. As pipelines purchased less and less gas for their own system-supply portfolio, there was a corresponding decreased need for transport services among and for interstate pipelines.

Once a significant part of the interstate market for natural gas, the market segment involving transactions among the major interstate pipeline companies has greatly diminished. In 1982, interstate pipeline companies sold 3,501 billion cubic feet (Bcf) of natural gas to other interstate pipelines and transported another 2,730 Bcf for one another. These transactions accounted for 40 percent of the gas shipped through the interstate system. By 1987, this share had declined to 19 percent. Sales volumes plummeted to 25 percent of their 1982 level, while transportation volumes declined by 31 percent between 1982 and 1987.

The reorientation of interstate pipeline activities is most pronounced in terms of the relative volumes sold to other interstate pipelines. In 1982, these sales represented 23 percent of the total throughput (sales plus transportation volumes) for all customers in all market segments. By 1987, such sales accounted for only 6 percent of the total throughput. This decline has been particularly significant because, as already noted, interpipeline sales were once quite large and because these lower sales volumes have not been totally offset by increased transportation volumes.

A major reason for the initially large overall decline in transactions among interstate pipeline companies was the gas surplus of the mid-1980's. An earlier study found that pipeline companies, when faced with declining sales of natural gas, responded by first reducing purchases from other pipelines before cutting back on wellhead purchases from producers. This is partially due to the often highly restrictive terms included in contracts governing wellhead purchases at that time.[7] However, the decline continued long after companies had a chance to adjust to the gas

[7]Energy Information Administration. *Wellhead Purchases by Interstate Natural Gas Pipeline Companies Since the NGPA: Trends and Profiles.* DOE/EIA-0510. Washington, DC, March 1988.

surplus and gain some experience with open-access transportation programs. To some extent this may represent a longer-term response to the gas surplus, but it may also indicate a tendency of some companies to continue to try to make maximum use of their own capital resources, either to improve their competitive position or to maximize throughput on their own pipeline systems.

Regardless of the reasons, the decline in transactions among interstate pipeline companies is in and of itself a dramatic development of the 1980's. Whereas in other market segments that have experienced declining sales volumes, interstate pipeline companies have increased the volume of gas transported for their customers (or even expanded their markets), no comparable increase in transported volumes has occurred in the segment of the market dealing with other interstate pipeline companies.

Intrastate Pipelines and LDC's: Sales To and Transport For

This category consists of gas volumes that flow downstream from the interstate system into other gas transportation and distribution systems. Interstate pipelines provide both sales and transportation volumes to intrastate pipelines, or directly to LDC's, for subsequent resale and distribution to end users. (An intrastate pipeline, in turn, sells and/or transports the gas received from the interstate pipeline either to an LDC or directly to an end user)

The overall volume of gas delivered by interstate pipelines to LDC's and intrastate pipelines stayed relatively stable between 1982 and 1985, ranging from a low of 7,941 Bcf (transportation plus sales) in 1983 to a high of 8,636 Bcf in 1985 (Table 5). The relative stability of the total gas deliveries to intrastate pipelines and distributors masks a major shift from sales to transportation programs. From less than 5 percent of deliveries to intrastate pipelines and LDC's in 1982, transportation program volumes rose at a rapid and steady pace through 1987, when they accounted for more than half (58 percent) of all deliveries to these customers. The smallest percentage increase in any single year was 50 percent (between 1985 and 1986), which was followed in 1987 by the largest annual increase, in absolute terms, to date (almost 1.8 Tcf).

The shift away from system sales and toward transportation programs has occurred for two fundamental reasons:

- The increasing availability of spot-market gas to LDC's through the expansion of open-access programs
- The continuing (although lessening) price advantage of spot-market purchases relating to the persistently higher prices for pipeline purchases.[8]

The prospects for continuing increases of this magnitude appear doubtful, however, given recent pricing developments (see Chapter 4). During the winter of 1987-1988, system-supply prices approached spot-market levels, removing much of the incentive for intrastate pipelines and LDC's to buy gas on the spot market. In addition, the appearance of occasional shortages of spot supplies further encouraged a switch back to the relatively more reliable system supply.

End Users and Marketers: Sales To and Transport For

This category consists of volumes of gas sold to or transported for two types of customers who previously played little or no role in the interstate market. End users have traditionally obtained only small volumes of gas directly from interstate pipelines through main line or direct sales, while gas marketers (also called brokers) represent establishments that are almost totally new additions to the interstate marketplace.

The typical end-user participant in the interstate market is either a large industrial customer requiring natural gas in its production processes or in its operations, or an electric utility. More recently, however, interstate pipeline companies have added large commercial customers to their slate of direct sales and transportation customers.

Gas marketers act as intermediaries between the different participants in the interstate market. Within the interstate market, they arrange transactions among sellers (producers and interstate pipelines), transporters (interstate and

[8] Based on price levels compiled from data supplied by 46 major interstate pipeline companies on the Federal Energy Regulatory Commission Form 11, "Natural Gas Pipeline Company Monthly Statement" through the third quarter of 1988. Also, see Chapter 4.

intrastate pipelines), distributors (LDC's), and end users (industrial, electric utility, and commercial customers). Their entry into the marketplace has facilitated an increasingly diverse range of alternative marketing arrangements, particularly those involving LDC's and end users who traditionally relied on the system supplies of traditional transporters for most of their natural gas requirements. Marketers may either assume ownership of the gas themselves and resell it to other market participants, or simply arrange sales and transportation deals among suppliers, transporters, distributors, and end users.

The data on transportation for marketers included in Table 5 represents only those arrangements under which the marketer assumes ownership of the volumes of gas delivered by the interstate pipelines, or has been reported by the interstate pipeline as the designated principal for delivery of the gas. Marketers resell owned-volumes either to LDC's (for subsequent resale) or directly to end users, and arrange transportation of volumes for which the marketer is the designated principal.

End users and marketers represent the most rapidly changing marketing segment for interstate pipelines. The total volume of sales and transportation program gas delivered to these two types of pipeline customers has more than tripled since 1982 (3,098 Bcf in 1987 compared with 829 Bcf in 1982). This growth is apparently due both to the additional volumes handled by and for gas marketers and the increasing spot-market purchases by industrial and electric utility customers for transportation by traditional system suppliers (interstate pipelines and LDC's).

Growth in the end-user segment of the interstate market has occurred entirely through increases in the use of transportation programs (Table 5). Direct sales to end users never have been a large part of the total deliveries (sales to and transport for all marketing segments) by interstate pipelines. In 1982, these sales (491 Bcf) represented only 3 percent of total deliveries. This market segment was the first to be threatened by the high system-supply prices of natural gas in 1982, and therefore became the target of initiatives such as Special Marketing Programs (SMP's) designed to lower the cost of natural gas to industrial end users with fuel-switching capacity. Despite attempts by pipelines to maintain these customers on system supply, by 1987 sales to end users had declined to less than half their 1982 level. Large-volume transport program customers in end-use markets continue to maintain extensive leverage in the marketing strategies of the interstate pipelines for two reasons: their ability to use alternative fuels, and their relatively large contribution to coverage of pipeline fixed costs.

Volumes transported for end users and marketers, meanwhile, have increased very rapidly. The 1987 level of 2,870 Bcf (twice the previous year's level and nearly 8.5 times the 1982 volume) represented 25 percent of all pipeline deliveries (excluding deliveries to other interstate pipelines) in that year. This compares with less than 4 percent of such deliveries in 1982.

The interstate pipeline companies' marketing emphasis on deliveries to end users and marketers has shifted further and faster away from sales and towards transportation programs than that of the intrastate pipeline and LDC segment. Volumes delivered to end users and marketers under transportation programs now account for 93 percent of all interstate deliveries to these customers, while transported volumes comprise only 58 percent of deliveries to intrastate pipelines and LDC's. One reason for this difference may be that end users as a group may perceive less need for the stability of system supply than intrastate pipelines and LDC's. Many industrial customers, even those that do not bypass their LDC, subscribe to the less expensive interruptible service if their operations do not require a steady rate of deliveries. Others may subscribe to the less expensive interruptible service, despite their need for steady deliveries for normal operations, in light of the infrequency of curtailments since the gas surplus developed. In addition, customers with fuel-switching capabilities may decide to change their purchasing patterns to replace system-supply gas with spot-market purchases or with another fuel (or vice versa) on the basis of very small price changes.

Regional Markets

Information on participation in transportation programs within intrastate markets is not so readily available as that for the interstate market. One reason is the relatively smaller number of interstate pipeline companies that handle all gas shipped between States, compared with the significantly larger number of intrastate pipelines and LDC's that deliver gas within individual States nationwide. Furthermore, because these companies fall under State, not Federal, jurisdiction, they do not all operate under the same set of regulatory guidelines or report to any one oversight agency. However, data are available on use of transportation programs by industrial

and electric utility company end users, regardless of whether the gas was delivered under Federal (interstate) or State (intrastate) jurisdiction. Although commercial end users and LDC's also participate in transportation programs, comparable data for these customers is unavailable. These data provide a good indication of the degree to which State regulatory bodies have allowed or encouraged transportation programs, although the specific nature of such programs varies greatly from State to State.

Overall Trends

Nationally, the volumes of transportation program gas delivered to ultimate end-use customers grew steadily between 1982 and 1987, despite overall declines in total deliveries (Table 6). In 1982, the approximately 1.4 Tcf of natural gas delivered to industrial and electric utility customers under transportation programs represented less than 9 percent of total deliveries to all customers. By 1987, transportation program volumes delivered to these same customers nearly tripled to about 4 Tcf representing 26 percent of total deliveries to all customers. Encouraging the trend toward increased use of natural gas by industrial and electric utility customers was the repeal, in 1986, of the Power Plant and Industrial Fuel Use Act of 1978. This law, enacted in response to the gas curtailments of the late 1970's, had placed major restrictions on use of natural gas by these two classes of end users.

By far the largest volumes of customer-owned gas transported by pipeline and distribution companies are delivered to electric utility and industrial users. Residential and small commercial customers are still served primarily or exclusively through gas utility system supply. Some gas delivered under transportation programs is covered by long-term purchase contracts, but recently most volumes have been transported under short-term agreements and/or purchased on the spot market. Transportation arrangements typically require several third-party transporters to move volumes from the seller's point of origin to the purchaser's point of consumption. In general, industrial and electric utility customers, who are particularly large consumers of gas, are in a better position to negotiate purchases from producers and make transportation arrangements with pipelines and distributors. In addition, some have the flexibility to substitute other fuels whenever the gas obtained through transportation programs becomes unavailable or spot-market prices rise above the cost of the alternative fuel.

As a proportion of the total gas delivered to industrial and electric utility customers, the transportation program gas rose from 16 percent to 46 percent between 1982 and 1987. In addition, in 1987, the first year such data was collected, large commercial customers obtained nearly 7 percent of their deliveries under transportation programs.[9]

Transportation programs were originally heavily concentrated intrastate in the producing States of Texas, Oklahoma, and Louisiana (the southwestern United States, Figure 3), although smaller scale transportation programs also operated in the southeastern part of the country. Marketing of separate transportation services began to expand during the mid-1980's for deliveries in the industrial areas of the mid-Atlantic seaboard and midwestern States, but somewhat later in western States (Figure 4). Only in New England, where gas markets overall are small and petroleum products are used heavily, has a transportation program yet to emerge (Figure 5).

Regions in Which Transportation Program Use Developed Early

In the West South Central, the East South Central and South Atlantic regions, the use of transportation programs to replace direct sales and system-supply purchases emerged earlier than in the other regions of the United States. In 1982, transportation programs provided 28, 14, and 11 percent of deliveries to industrial and electric utility customers in these regions (Table 6). Since 1982, the use of the unbundled transportation service market by large end users has more than doubled in the East South Central and South Atlantic regions, although program use in other regions now surpasses them in terms of both absolute volumes and the proportion of transportation volumes delivered to industrial and electric utility customers. The use of transportation programs by end users in the West South Central region started out ahead of that of all other regions. Moreover, it expanded nearly 90 percent by 1987 and remains the largest in the country. In all three regions with early transportation programs, industrial and electric utility customers account for the majority of volumes delivered to all customers within each State.

[9]Energy Information Administration, *Natural Gas Annual 1987*, DOE/EIA-0131.

Table 6. Natural Gas Transported for Industrial and Electric Utility End Users versus Total Deliveries by Census Division, 1982-1987
(Volume in Billion Cubic Feet)

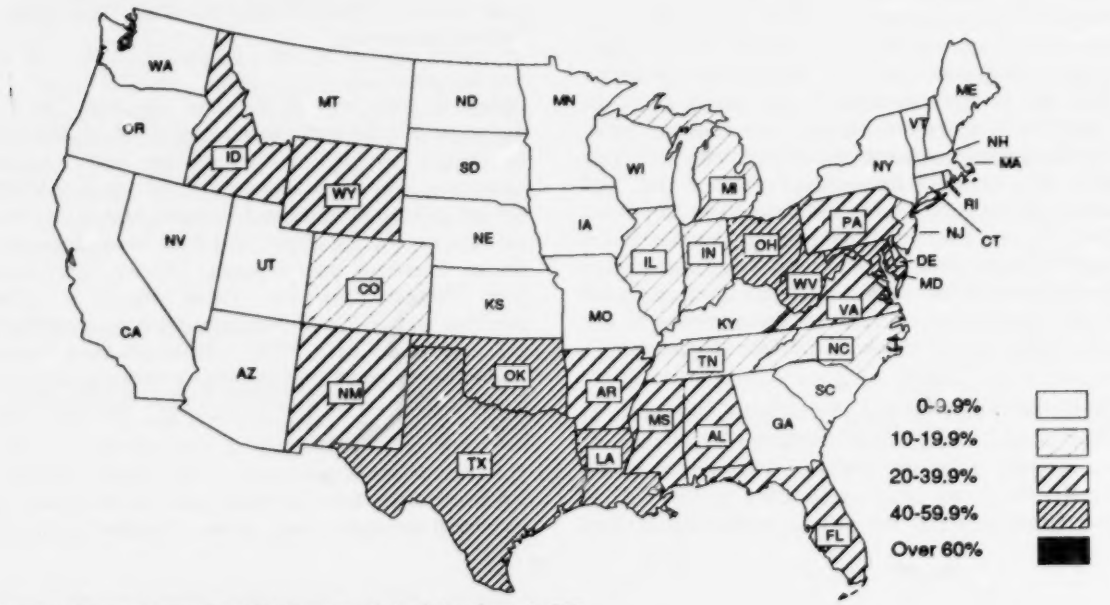
Census Division	Annual Volume					
	1982	1983	1984	1985	1986	1987
	Total Deliveries to All Ultimate End Users					
New England	316	310	338	343	307	370
Middle Atlantic	1,806	1,732	1,837	1,723	1,647	1,752
East North Central	3,263	3,055	3,231	3,090	2,928	2,880
West North Central	1,256	1,150	1,200	1,165	1,062	1,036
South Atlantic	1,291	1,257	1,303	1,222	1,217	1,295
East South Central	795	742	799	727	682	690
West South Central	4,870	4,637	4,967	4,721	4,584	4,636
Mountain	732	668	693	657	576	585
Pacific	1,822	1,672	1,834	2,016	1,680	2,039
Total	16,149	15,223	16,202	15,665	14,683	15,333
	Industrial and Electric Utilities Only: Total Deliveries					
New England	66	92	106	110	64	115
Middle Atlantic	672	655	702	643	530	636
East North Central	1,109	1,054	1,107	1,056	983	942
West North Central	457	406	430	404	340	373
South Atlantic	728	695	729	689	663	700
East South Central	494	441	480	438	395	394
West South Central	4,157	3,968	4,268	4,082	3,989	4,018
Mountain	310	264	266	239	188	187
Pacific	954	871	1,071	1,175	935	1,275
Total	8,948	8,447	9,161	8,836	8,087	8,641
	Industrial and Electric Utilities: Via Transportation Programs					
New England	0	0	0	0	a	5
Middle Atlantic	25	36	74	104	142	204
East North Central	26	68	129	237	378	627
West North Central	2	2	2	3	10	120
South Atlantic	79	86	106	142	150	191
East South Central	71	73	79	100	132	160
West South Central	1,170	1,355	2,001	1,880	2,009	2,192
Mountain	20	17	22	26	24	94
Pacific	2	3	26	28	85	364
Total	1,394	1,640	2,438	2,519	2,930	3,956
	Industrial and Electric Utilities: Transportation Program as Percent of Total Deliveries					
New England	0	0	0	0	b	4
Middle Atlantic	4	6	11	16	27	32
East North Central	2	6	12	22	38	67
West North Central	b	b	b	b	3	32
South Atlantic	11	12	15	21	23	27
East South Central	14	17	16	23	33	41
West South Central	28	34	47	46	50	55
Mountain	7	6	8	11	13	50
Pacific	b	b	2	2	9	29
Total	16	19	27	29	36	46

[a]Less than .5 Bcf.
[b]Less than .5 percent.
Source: Energy Information Administration, *Natural Gas Annual* (1986 and 1987).

Figure 3. Percent of Gas Delivered to Industrial Users and Electric Utilities Moving Under Transportation Programs, by State, 1982

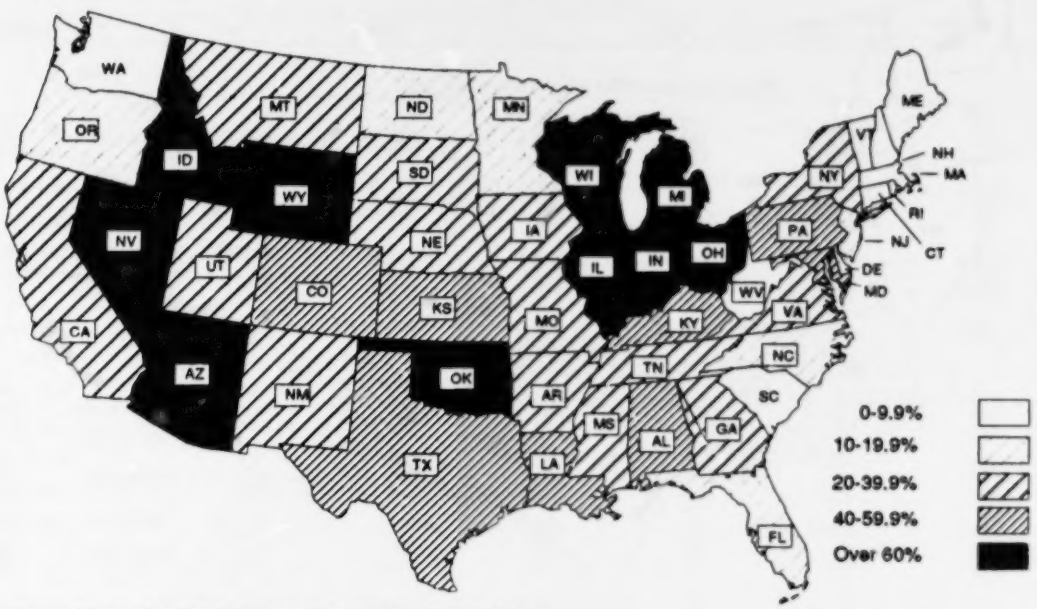
Source: Energy Information Administration, *Natural Gas Annual 1986.*

Figure 4. Percent of Gas Delivered to Industrial Users and Electric Utilities Moving Under Transportation Programs, by State, 1985



Source: Energy Information Administration, *Natural Gas Annual 1987.*

Figure 5. Percent of Gas Delivered to Industrial Users and Electric Utilities Moving Under Transportation Programs, by State, 1987.



Source: Energy Information Administration, *Natural Gas Annual 1987*.

West South Central Region

Not surprisingly, the West South Central region (Texas, Louisiana, Oklahoma, and Arkansas), which comprises the major natural gas producing area of the United States and consumes more gas than any other region, has the longest exposure to large-scale, end-user transportation programs. In 1982, this region accounted for 84 percent of all the transportation program gas delivered to end users. Despite continuing growth in transportation volumes each year except 1985, by 1987 the region's share of the total end-user transportation market had dropped to 55 percent as the use of transportation programs expanded even further throughout other regions. Nonetheless, the extent to which end-user transportation programs have remained relatively important in the large producing States of this region remains a major feature of the National pattern.

Through 1986, industrial and electric utility customers in the West South Central region obtained a larger share of their deliveries under transportation programs than did such customers in any other region. Only in 1987 did use of these arrangements by end users in another region (East North Central) exceed that of the West South Central region. In terms of absolute volumes, the West South Central region continues to account for a large share of total transportation program deliveries. A major distinction is that most of these volumes fall under State rather than Federal jurisdiction.

Industrial customers in three of the four States (the exception is Arkansas) depend heavily on nearby sources of natural gas (and oil) to enhance their competitive advantage. Firms that also use natural gas as a feedstock (which include chemical and fertilizer companies) became the first to seek out direct sales from local producers and obtain short-haul transportation. Initially, most supplies were obtained from the system supply of intrastate pipelines and LDC's. However, as the price of direct-sales gas rose in the early 1980's, these industrial customers sought lower-priced supplies from producers, arranged for transportation services, and decreased their purchases of system-supply gas.

Arkansas differs from the other States in the region in that its overall industrial market is much smaller and it did not

develop a significant end-user transportation market until 1984. The three major producing States in the region all started out with well-established end-user transportation markets in 1982, especially for intrastate gas. In each of these States, however, the market for unbundled transportation has evolved along its own path (Table 7), as end users moved further into the spot market as a source of supply and became more involved in using separate transportation services.

- Louisiana has a very stable delivery system. Its unbundled transportation services sector has accounted for between 46 and 48 percent of the total gas delivered to its industrial and electric utility customers in every year since 1982. This stability is in striking contrast to the growth of end-user transportation/delivery programs in other States, both within and outside the region. As a result, of all the States of the West South Central region, Louisiana's transportation program volumes fell from 41 percent in 1982 to less than a quarter of the regional total by 1987. A major reason for this was the increase in end-user transport volumes that moved in Texas.

- Texas now has the largest absolute volume of gas moving through transportation programs of any State in the country, although other States now surpass Texas in terms of the proportion of end-user gas delivered under transportation programs. Transportation program gas as a proportion of all gas delivered to industrial and electric utility customers in Texas rose from 19 percent in 1982 to 54 percent in 1987.

- In 1982, Oklahoma's transport market resembled that in Louisiana (46 percent of total industrial and electric utility deliveries). In the years since, transportation program gas has come to dominate the Oklahoma market, reaching 84 percent of deliveries to industrial and electric utility consumers in 1987--the highest of any state in the country.

South Atlantic Region

The South Atlantic region overall exhibited steady growth through 1987 in end-user deliveries via transportation programs. However, due to the explosive growth rates experienced in other regions, it is now the second smallest regional market (after New England) in terms of the transport gas proportion of deliveries to industrial and electric utility customers (27 percent). This relatively modest growth in market share for transportation programs in the region, as a whole, masks much diversity among States in the region.

- In 1982, end users in Florida accounted for 99 percent of the transport program gas moved within the South Atlantic region. Since 1982, however, Florida's transportation program deliveries have shrunk in both absolute and relative terms. Transportation volumes in 1987 were only 41 percent of their 1982 level. This represented only 14 percent of deliveries to industrial and electric utility customers in 1987, compared with 29 percent in 1982. The Florida market has gone against both regional and national trends in large part as a result of market strategies pursued by Florida Gas Transmission, the only interstate pipeline serving the State: (1) This pipeline has remained outside FERC's open-access framework (although in late 1988 it has applied for an Order 500 certificate); (2) it has consistently cut the volume of gas it delivers outside of system supply; (3) it has taken advantage of a growing market; and (4) it has one of the industry's lowest weighted average cost of gas. The pipeline, in turn, has also been influenced by Florida Power Company, its largest customer. Florida Power initially pressed for expansion of the pipeline's transportation program, and its ability to switch to alternative fuels may have provided an incentive for Florida Gas Transmission to lower its system supply price in order to retain sales volumes.

- By 1984, end users in Maryland and West Virginia were well-established in the use of transportation programs. End users in Delaware, North Carolina, and Virginia developed their use of transport programs by 1985, and those in Georgia by 1986. West Virginia shares with Oklahoma the distinction that its electric and industrial customers obtained more than 80 percent of their deliveries under transportation programs in 1987.

- At the other extreme, South Carolina end users have had the least significant transport market utilization outside of New England.

Table 7. Total Deliveries to Industrial Users and Electric Utilities and Percent Delivered Through Transportation Programs by Census Division and State, 1982-1987
(Volume in Billion Cubic Feet)

State	Total Deliveries to Industrial and Electric Utilities						Percent Via Transportation Agreements					
	1982	1983	1984	1985	1986	1987	1982	1983	1984	1985	1986	1987
New England												
Connecticut	21	21	23	20	18	27	0.0	0.0	0.0	0.0	0.1	6.3
Maine	1	1	1	1	1	1	0.0	0.0	0.0	0.0	0.0	0.0
Massachusetts	35	59	69	78	39	74	0.0	0.0	0.0	0.0	a	3.2
New Hampshire	1	1	2	1	1	2	0.0	0.0	0.0	0.0	0.0	0.0
Rhode Island	6	8	9	7	3	10	0.0	0.0	0.0	0.0	0.0	5.8
Vermont	2	2	2	2	2	2	0.0	0.0	0.0	0.0	0.0	0.0
Total	66	92	106	110	64	115	0.0	0.0	0.0	0.0	0.1	4.1
Middle Atlantic												
New Jersey	147	178	180	143	107	155	1.9	1.5	7.4	11.7	13.7	15.3
New York	263	233	277	272	220	262	0.0	1.2	2.0	6.4	20.3	26.6
Pennsylvania	262	244	246	228	203	219	8.4	12.8	22.4	30.7	40.5	50.4
Total	672	655	702	643	530	636	3.7	5.6	10.5	16.2	26.7	32.0
East North Central												
Illinois	297	288	305	287	270	264	0.0	1.8	7.7	19.9	24.8	61.1
Indiana	227	211	223	212	184	203	0.4	2.2	4.9	15.9	33.3	67.3
Michigan	196	180	199	192	183	135	0.0	0.3	2.1	11.9	45.2	63.8
Ohio	269	259	261	248	236	224	9.3	22.3	34.9	48.0	62.4	77.3
Wisconsin	120	116	119	117	109	115	0.0	0.0	0.0	3.5	17.4	60.1
Total	1,109	1,054	1,107	1,056	983	942	2.3	6.5	11.7	22.5	38.4	66.5
West North Central												
Iowa	92	88	96	89	82	89	0.0	0.0	0.0	0.2	4.4	37.1
Kansas	180	143	150	140	115	127	0.9	1.1	1.0	1.2	3.1	42.9
Minnesota	71	68	72	66	60	69	0.0	0.0	0.0	0.0	2.0	14.6
Missouri	69	62	62	67	56	56	0.0	0.0	0.1	1.2	1.8	23.2
Nebraska	39	39	40	34	22	25	0.0	0.0	0.0	0.8	2.0	31.4
North Dakota	2	2	5	2	3	3	0.0	0.0	2.8	2.4	13.5	12.0
South Dakota	4	4	4	4	3	3	0.0	0.0	1.8	0.0	4.8	23.7
Total	457	406	430	404	340	373	0.4	0.4	0.4	0.7	3.0	32.1
South Atlantic												
Delaware	18	25	32	29	23	26	0.0	0.0	8.4	20.5	22.4	11.4
Florida	267	249	246	234	229	236	29.3	29.3	24.7	22.9	17.9	13.7
Georgia	146	142	150	141	134	142	0.0	0.0	0.0	7.9	23.5	39.5
Maryland	57	48	59	56	55	70	0.5	9.9	37.7	53.8	56.6	56.1
North Carolina	79	75	80	75	74	78	0.2	2.4	6.0	12.5	4.1	16.1
South Carolina	62	64	70	64	63	66	0.4	3.5	2.6	1.7	0.7	0.0
Virginia	53	50	50	52	49	41	0.0	0.4	5.7	24.0	29.0	34.2
West Virginia	47	42	43	38	37	42	0.0	9.6	25.9	46.2	64.9	81.6
Total	728	695	729	689	663	700	10.8	12.4	14.5	20.5	22.7	27.3
East South Central												
Alabama	147	129	135	133	118	118	20.5	14.5	13.2	20.6	24.1	44.6
Kentucky	57	54	60	55	49	55	0.0	1.2	2.8	9.3	41.3	58.5
Mississippi	180	159	182	153	137	124	22.6	34.0	32.3	31.7	36.0	36.9
Tennessee	110	100	103	97	92	98	0.0	0.0	0.2	19.8	33.7	30.7
Total	494	441	480	438	395	394	14.3	16.6	16.4	22.8	33.3	40.7

See footnote at end of table.

Table 7. Total Deliveries to Industrial Users and Electric Utilities and Percent Delivered Through Transportation Programs by Census Division and State, 1982-1987 (Continued)

State	Total Deliveries to Industrial and Electric Utilities						Percent Via Transportation Agreements					
	1982	1983	1984	1985	1986	1987	1982	1983	1984	1985	1986	1987
West South Central												
Arkansas	139	124	119	108	121	87	3.0	3.1	13.4	27.3	40.4	33.3
Louisiana	1,054	987	1,139	995	1,063	1,059	45.5	47.5	48.3	48.0	47.0	48.1
Oklahoma	431	402	408	357	346	371	45.7	50.8	48.6	57.9	79.4	83.7
Texas	2,533	2,456	2,602	2,621	2,460	2,501	19.3	27.6	47.5	44.5	46.2	53.7
Total	4,157	3,968	4,268	4,082	3,989	4,018	28.1	34.1	46.9	46.1	50.4	54.6
Mountain												
Arizona	61	49	55	58	39	39	13.7	9.1	12.7	2.5	0.0	66.3
Colorado	51	47	46	42	39	39	0.0	0.3	1.0	11.3	28.5	50.0
Idaho	24	20	19	19	16	19	19.3	17.6	21.2	24.3	12.5	67.2
Montana	12	12	10	9	8	8	0.0	5.6	10.9	8.8	15.9	23.4
Nevada	22	19	18	14	10	13	0.0	0.0	0.0	0.0	0.0	69.4
New Mexico	65	52	52	40	28	32	11.0	14.3	16.6	21.7	0.0	28.0
Utah	43	42	43	38	28	24	0.0	0.0	0.0	0.0	0.0	25.3
Wyoming	32	24	23	19	19	15	0.0	1.8	2.9	30.9	53.0	74.8
Total	310	264	266	239	188	187	6.5	6.3	8.2	10.9	12.9	50.2
Pacific												
California	874	788	969	1,074	849	1,173	a	0.2	2.4	2.2	8.8	30.1
Oregon	32	32	39	38	31	37	6.5	5.5	6.6	8.6	16.7	12.2
Washington	47	51	63	63	54	66	0.2	0.3	0.2	1.1	9.7	8.9
Total	954	871	1,071	1,175	935	1,275	0.2	0.4	2.4	2.4	9.1	28.5

[a]Less than .05 percent.
Source: Energy Information Administration, *Natural Gas Annual* (1986 and 1987).

East South Central Region

The markets of the East South Central region have experienced significant growth in the use of transport programs by large users. Movement under these programs accounted for 41 percent of deliveries to industrial and electric utility customers in 1987. Within the region, States followed two alternative paths in their market development:

- Mississippi and Alabama end users started out with considerable volumes of gas moved via transport programs in 1982, but have shown relatively slow growth in transportation program deliveries since 1982. The transport market growth is more impressive, however, if one considers that these volumes have continued to increase despite drops of 31 and 20 percent in total deliveries to industrial and electric utility customers in Mississippi and Alabama, respectively.
- End-user transport program usage in Kentucky and Tennessee showed significant development only since 1985, being relatively inactive previously. The recent growth reflects a shift from system supplies to spot-market purchases by end users in these States.

Regions in Which Transportation Program Use Emerged in the Mid-1980's

Transportation program deliveries to industrial and electric utility customers in the Middle Atlantic and East North Central regions have exceeded 10 percent of total end-user deliveries since 1984. The use of transportation programs to access gas supplies has expanded much more rapidly in the East North Central region, reaching 67 percent of deliveries in 1987 compared with 32 percent in the Middle Atlantic States.

Middle Atlantic Region

The State with the greatest use of transportation programs by end users in the Middle Atlantic region is Pennsylvania. End users in that State began to participate in transportation programs earlier than other States in the region. By 1987, transport volumes made up about half the deliveries to industrial and electric utility customers in Pennsylvania. New York and New Jersey did not have significant end-user transportation markets before 1985. Although the transport share of deliveries to industrial and electric utility customers in these States has grown, both markets remain modest in comparison to Pennsylvania and other regions of the country.

East North Central States

The industrial East North Central Region, a large consuming region that gets most of its gas from outside the region, ranked second to the West South Central region in total volumes of gas delivered via transportation programs in 1987. The region ranked first nationwide in terms of the proportion of industrial and electric utility deliveries obtained under transport programs (over 66 percent in 1987).

An unusual aspect of the East North Central region is the degree to which markets in all States have grown in a similar manner. In 1987, industrial and electric utility customers in every State in the region obtained at least 60 percent of their gas deliveries under transportation programs. Large end users in Ohio, however, entered the unbundled transportation services market earlier--and in Wisconsin later--than those in other States in the region.

Ohio is the largest producer of natural gas in the region, which may have contributed to its relatively earlier start with transportation programs. The State also has a history as an innovator. Ohio was one of the leaders in developing self-help gas programs in the 1970's, an experience that may have set the foundation for the subsequent establishment of transportation programs. (Self-help programs encouraged the drilling of new wells by allowing relatively high prices on gas produced to serve high priority customers who might otherwise have been curtailed). Compared with industrial and electric utility customers in other States in the region, Ohio's end users have consistently obtained higher percentages of their deliveries under transport programs (77 percent in 1987).

Regions in Which Transportation Program Use Expanded After 1985

End users in the western areas of the United States (excluding the Southwest) tended to shift toward the use of transportation programs somewhat later than end users in other regions of the country. Most of the transportation program growth in these markets has occurred only since 1986.

Mountain States

Although the Mountain region produces large volumes of gas, the volumes consumed in the region make up a small part of the national market. Transportation programs accounted for at least 10 percent of deliveries to the region's industrial and electric utility customers since 1985. Significant growth in transportation programs in this region has occurred only more recently. Between 1986 and 1987, transportation volumes nearly quadrupled. As a result, the transport share of deliveries to industrial and electric utility customers jumped from 13 percent in 1986 to 50 percent in 1987.

Within the Mountain region, end users in Colorado and New Mexico have steadily increased their use of transportation programs. New Mexico resembles the other producing States of the West South Central region in that its end users have participated in a fairly well-developed transportation program since 1982. Colorado's growth, on the other hand, has occurred mostly since 1985. Idaho's end users have been actively using transportation programs since 1982, but not at a sustained level. Utilization in Arizona's market seesawed between 1982 and 1986, then expanded significantly along with markets in most other States in the region in 1987.

West North Central Region

The West North Central region also makes up a relatively small part of the national market, since the States that comprise the region are less populated and have had less industrial growth than most other States. Only recently did end users in this region begin to make widespread use of transport programs. In some respects, it resembles the experience of the Mountain region. Prior to 1987, transport volumes had accounted for only 3 percent or less of deliveries to industrial and electric utilities in this

region. In 1987, they expanded rapidly (although not so explosively as in the Mountain region) to nearly one-third of the deliveries to these customers as a result of a nearly twelvefold increase in volumes over the previous year.

Unlike the transport market programs within the Mountain region, for which trends vary from State to State, the end-user transport market grew in a fairly similar manner across most States within the West North Central region. Kansas, the region's largest producer as well as consumer of natural gas, has the most extensive transport market in the region. North Dakota, with a total market size less than 10 percent that of Kansas, in 1986 became the first State in the region to have its industrial and electric utility customers use transport programs for more than 10 percent of their deliveries.

Pacific Region

In the Pacific region, only in Oregon have end users utilized transportation programs over the years. However, the share of total deliveries to industrial and electric utility customers under these programs was not very significant prior to 1986. Given the large size of the California market, the experience of the Pacific region largely reflects market developments in California. End users in California, however, did not make widespread use of transportation markets before 1987, when industrial and electric utility customers obtained 30 percent of their total deliveries under transportation agreements. Although end users in Washington obtain a greater volume of gas via transportation arrangements than their counterparts in Oregon, these accounted for less than 10 percent of deliveries to industrial and electric utility customers through 1987.

The relatively slow growth of end-user transportation programs in the Pacific region is not surprising, given that the two major California utilities (Southern California Gas and Pacific Gas and Electric) dominate the regional access to spot markets for system supply. These two utilities are by far the largest in the country and account for the major share of all gas deliveries to end users on the West Coast. In many respects, they are more akin to large interstate pipelines than to other LDC's.

California provides a good example of the difficulties of translating the trend toward open-access transportation in the interstate market into open access in local markets dominated by the intrastate suppliers (or LDC's). The players in the California market early on developed, or had access to, spot-market supplies or their equivalent: Canadian imports were available under flexible contract arrangements (mainly via Pacific Gas Transmission), and two major interstate suppliers to the California market, El Paso Natural Gas Company and Transwestern Gas Pipeline, provided transportation of Southwestern (spot-market) supplies. Whereas the local (in-State) pipelines and LDC's were able to follow a least-cost purchasing strategy by purchasing spot-market gas, they did not open up their pipeline capacity to transport these less expensive supplies for end users within the State. This put them in a position in which they could retain sales customers, and therefore maintain throughput of system supply. The California Public Utilities Commission is currently attempting to implement its own open-access program. California's program in some respects mirrors FERC's program for the interstates, and is intended to facilitate transportation for end users in the State. So far, however, transport gas in California largely stops when gas crosses the State's border and enters one of the two large LDC systems.

New England

Due to the distance from major producing areas, customers in this region pay the highest total average price for natural gas in the continental United States. This consideration coupled with limited pipeline capacity for transporting gas over long distances (the region lacks local supplies of natural gas) has suppressed development of sales as well as transportation markets in the New England region. No end-user transportation program deliveries were reported anywhere in the region prior to 1986, and end users in only Connecticut, Massachusetts, and Rhode Island reported any utilization of transportation services by 1987.

The trends for this region are likely to change over the next several years, as a result of a number of efforts now underway (approved by FERC in late 1988) that would increase pipeline capacity into the New England and Mid-Atlantic States. The Northeast Project calls for the construction of additional pipeline capacity to move increased volumes of Canadian imports into the Northeast, and to provide new interconnections with pipelines acquiring gas from the Southwestern United States. The project is to be completed and capacity available by late 1992.

Summary

By 1987, end users in the industrial areas of the country from Pennsylvania westward to Illinois and Wisconsin widely adopted transportation programs as the dominant means of obtaining natural gas supplies for industrial and electric utility applications. While other areas lagged behind, the widespread use of transportation programs by end users in nearly all regions of the United States is self-evident. Although the pace of development has varied, end users in most regions reported participation in a fairly active unbundled transportation services market by 1987. This market sector has grown steadily and has become a major new instrument in natural-gas marketing.

The information reported also documents the existence of a significant interstate transportation market for natural gas in the U.S. marketplace. For the interstate pipeline companies, 1986 represented a major turning point. Since that time, their predominant role has become one of a transporter rather than a broker/transporter of natural gas. They now deal extensively with end users and brokers, and progressively less with one another. Even their traditional relationships with intrastate pipelines and LDC's have been altered with respect to the types of services provided. The following chapter examines in greater detail the experience of individual interstate pipeline companies and their role in the development of these new transportation markets.

3. Trends for Major Interstate Pipeline Companies

The rapid growth in the unbundled transportation of natural gas as a distinctly separate service from the sale of natural gas masks much diversity among the major transporters of natural gas for the interstate market. For instance:

- Some pipelines have always been in business primarily to transport gas on behalf of other interstate pipelines from producing regions (offshore and Rocky Mountains), as well as from the Canadian border.
- In addition, other pipelines have traditionally shipped large volumes of customer-owned gas under transportation arrangements provided under Section 7(c) of the Natural Gas Act of 1938 (NGA).
- Some companies did not initiate significant transportation programs until the decreasing sales levels in 1983 and beyond forced them to find methods for utilizing unused capacity. Later, under the open-access provisions of Federal Energy Regulatory Commission (FERC) Order 500, these early programs expanded further.
- Some companies have yet to develop an extensive program for transporting customer-owned gas.

Much of this variation can be explained simply by the fact that the individual companies typically pursue quite different market strategies, even though they are all subject to the same set of regulatory guidelines under FERC. The regulatory environment within the States to which they deliver gas has less of an effect on their market strategies, largely because interstate pipelines are not directly subject to State regulation. In addition, it makes little difference from the interstate pipeline's point of view whether the intrastate pipelines and local distribution companies (LDC's)--to which many major interstate pipelines deliver the largest share of their gas--also offer unbundled services. Indirectly, however, State policy can affect the interstate pipeline's market for both sales to end users and transportation of gas owned by end users. This is because State regulations prescribe the extent to which end users are allowed to bypass their LDC to purchase gas directly either from a producer or from a pipeline company. In addition, State guidelines prescribe how aggressively LDC's must actively seek spot-market gas as part of their least-cost purchasing strategies.

This chapter identifies and analyzes the differences among interstate pipeline companies in the extent to which they became active players in the unbundling of transportation services in the 1980's. It examines trends in the volumes these companies shipped under both sales and transportation programs to three primary market sectors:

- Other interstate pipelines
- End users and marketers
- Intrastate pipelines and LDC's.

In addition, this chapter addresses the role a pipeline's exposure to take-or-pay obligations may have played in its decision whether or not to adopt an aggressive transportation market strategy. Finally, variations among pipelines serving different regions of the United States are identified and analyzed.

Sales and Transportation Programs Among Interstate Pipelines

The total volumes of gas that pipelines ship for one another under both sales and transportation agreements have been in decline throughout the 1980's. Unlike other customers, for whom pipelines have substituted deliveries of customer-owned gas for system sales, pipelines as a group have reduced the total level of services they obtain from other pipelines. This trend, however, is not a universal one in that there is significant variation between the two distinct parts of this market sector: pipelines whose primary business revolves around serving other pipeline companies, and all other pipelines.

Pipelines whose primary customers are other pipelines include a number of offshore companies and several new pipelines that began shipping gas from the Rocky

Mountains and Canada during the 1980's. The offshore pipelines generally service the interstate pipelines that serve the East Coast, while the newer transporters were constructed to bring gas out of Canada into the West and upper Midwest or from the newly exploited reserves of the Mountain States and the Western Overthrust.

The Offshore, Rocky Mountain, and Canadian pipelines share several characteristics: (1) Most of the companies are either joint ventures or corporate subsidiaries set up by the major interstates; (2) Their primary business is the transportation of system-supply gas owned by major companies from the producing regions of the country; (3) Their sales for resale (as opposed to separate transportation services) are either nonexistent or, where they do occur, consist almost entirely of volumes delivered to corporate sponsors who prefer to purchase the gas from the pipeline for regulatory, competitive, or corporate reasons.

All other major interstate pipelines constitute the other group of pipelines considered in this study. These are the 20 companies for which aggregate level data were provided in Chapter 2. In addition to acquiring gas from the joint venture transporters, the major interstate pipelines provide one another with supplemental supplies through both sales for resale mechanisms and transportation of gas on the behalf of their counterpart pipelines. The 20 major interstate pipelines that are the focus of this analysis account for over 90 percent of the gas shipped by the approximately 134 interstate pipelines operating in the United States. The sales and transportation transactions (excluding exchange gas) among the interstate pipelines constitute a market segment that has shown more dramatic response to market restructuring over the past several years than that of the other segments.

Traditional Offshore Pipeline Suppliers

The predominant role of the offshore pipelines shown in Table 8 has traditionally been that of a transporter of gas to other interstate pipeline companies. The one partial exception is Sea Robin Pipeline Company (Sea Robin), whose sales volumes exceeded its transport program volumes through 1985. Sea Robin also became predominantly a transporter as its sales declined by 85 percent between 1982 and 1987, largely due to considerable reductions in the throughput of its two principal interstate pipeline customers and owners--Southern Natural Gas Company (Southern) and United Gas Pipeline Company (United).

Overall, throughput by this group of companies declined 11 percent between 1982 and 1987. The upturn in volumes shipped since 1985, however, suggests that the downward trend may have bottomed out. This assessment appears even more plausible if one examines the trends in transportation volumes these companies have shipped for other pipelines separately from Sea Robin's sales volumes. Although each company other than Columbia Gulf Transmission experienced declines in the volumes transported between 1982 and 1987, all but one company (Stingray Pipeline Company) have been able to increase their throughput volumes since 1985. In 1987, the volume of gas shipped under transportation programs reached 96 percent of the 1982 level.

The marked recovery since 1985 is in sharp contrast to continuing declines for some other parts of the industry, in particular the other major interstate suppliers discussed later in this section. A possible explanation may be the financial link between the joint venture companies and the parent pipeline companies to whom they ship gas supplies. As investors in the offshore companies, the parent pipelines have relatively little incentive to reduce the volumes transported to them by the joint venture company. Given a choice, they would more likely make any necessary reductions in volumes out of supplies obtained from other pipelines in which they have no financial interest.

Rocky Mountain and Canadian Pipeline Suppliers

As with the traditional offshore pipeline suppliers, these newer pipelines are joint ventures owned by the pipelines to whom they deliver gas.

Great Lakes Gas Transmission (Great Lakes), Northern Border Pipeline (Northern Border), Pacific Gas Transmission (Pacific Gas), and Northwest Alaskan Pipeline (Northwest Alaskan) transport Canadian supplies, while Overthrust Pipeline Company (Overthrust), Wyoming Interstate Company Limited (Wyoming Interstate), and Trailblazer Pipeline Company (Trailblazer) ship gas from the Rocky Mountains. Of the pipelines shipping Canadian gas, Northern Border only engages in transportation services, Northwest Alaskan only transports system supply, and the other two companies ship both sales and transportation volumes. The pipelines from the Rocky Mountains ship transportation volumes exclusively. The data for these pipelines in Table 8 include some

Table 8. Natural Gas Transportation Program and Sales Deliveries by Interstate Pipeline Companies Traditionally Serving Primarily as Transporters, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
Louisiana Gulf Offshore								
Transported for Others[a]								
Columbia Gulf Transmission	635.5	584.4	722.4	772.6	807.1	836.6	32	8
High Island Offshore System	577.0	481.3	497.4	389.8	394.9	492.0	-15	26
Sea Robin Pipeline Co	149.4	111.3	110.7	87.3	77.8	130.0	-13	49
Stingray Pipeline Co	326.8	267.2	284.2	264.4	238.1	242.4	-26	-8
U-T Offshore System	400.4	297.9	309.1	268.6	244.9	307.1	-23	14
Sales								
Sea Robin Pipeline Co	195.9	147.5	153.5	119.3	57.9	29.3	-85	-75
Total	2,285.0	1,889.7	2,077.3	1,902.0	1,820.7	2,037.3	-11	7
Canadian / Rocky Mountain								
Transported for Others[a]								
Great Lakes Gas Transmission	394.0	309.9	381.3	340.1	405.4	404.3	3	19
Northern Border Pipeline	55.0	134.9	139.7	194.7	140.5	223.7	307	15
Overthrust Pipeline Co	0.0	66.3	75.8	82.4	63.0	53.6	--	-35
Pacific Gas Transmission	102.1	68.1	69.6	109.2	105.4	120.9	18	11
Trailblazer Pipeline Co	0.0	74.6	83.1	99.0	71.2	54.8	--	-45
Wyoming Interstate Co. Ltd	0.0	81.7	94.7	111.7	89.1	65.4	--	-41
Sales								
Great Lakes Gas Transmission	65.3	33.5	27.7	36.2	31.4	33.6	-49	-7
Northwest Alaskan Pipeline	108.5	149.5	160.7	208.1	163.4	170.5	57	-18
Pacific Gas Transmission	252.6	247.7	231.3	298.1	242.1	358.4	42	20
Total	977.6	1,168.2	1,264.0	1,479.6	1,311.5	1,485.2	52	0
Grand Total	3,262.6	3,057.8	3,341.2	3,381.5	3,132.2	3,522.5	8	4

[a]Transported volumes do not include exchange and compression gas transactions.
-- = Not applicable.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

doublecounting, since Overthrust feeds into Wyoming Interstate, which in turn transports some gas to Trailblazer.

The pipelines from the Rocky Mountains experienced declines in volumes ranging from 35 to 45 percent between 1985 and 1987, despite a steady rate of expansion up until 1985. The transporters of Canadian gas, on the other hand, were generally able to maintain or even increase their throughput after 1982 as the price of Canadian supplies rapidly decreased. Although Northwest Alaskan's sales volumes dropped by 18 percent between 1985 and 1987, the 1985 volume represented an abnormally high level of sales for the company--1987 volumes were actually up 57 percent from 1982. Great Lakes' sales volumes declined 49 percent since 1982, but this reflects a switch to transportation volumes as the company's total throughput in 1987 was down less than 5 percent from 1982. Pacific Gas has increased both sales and transportation volumes, while Northern Border's transportation volumes have quadrupled--the largest increase of the companies in this group.

It appears, therefore, that joint venture pipelines that tap new supply sources, particularly in Canada, have become important players in the interstate pipeline industry during a period in which business among interstate pipelines generally has declined.

Major Interstates as Suppliers

Interstate pipeline companies have traditionally bought a significant proportion of their gas from other major independent pipeline companies. Unlike sales among pipeline companies connected through joint venture investments--which have either held firm or converted to transportation arrangements--sales among unrelated pipeline companies experienced the most severe decline of

any sector of the interstate market in recent years. Furthermore, transportation programs failed to recoup lost sales in this market sector.

Sales volumes for interstate pipelines providing supplementary supplies to other pipelines have dropped every year since 1982, resulting in a cumulative decline of 75 percent by 1987 (Table 9). This trend applies to 19 of the 20 major pipelines included in this group. For 8 of the companies, the cumulative decline exceeds 90 percent: ANR Pipeline Company (ANR), Colorado Interstate Gas Company, Enron Corporation (Enron), Natural Gas Pipeline of America (Natural), Panhandle Eastern Pipe Line Company, Transwestern Gas Pipeline (Transwestern), Trunkline Gas Company (Trunkline), and United. Most severely affected have been the companies serving the Midwest.

Only Florida Gas Transmission (Florida Gas) sold more gas to other pipelines in 1987 than in 1982. Its total volumes, however, represent less than 1 percent of this market sector. By 1987, only 4 companies were still playing a major role reselling gas to other pipeline companies: Tenneco Incorporated (Tenneco), Texas Eastern Transmission (Texas Eastern), Texas Gas Transmission Company (Texas Gas), and Northwest Pipeline Company (Northwest). Together, these companies accounted for more than 90 percent of all gas sold by supplemental suppliers in 1987. Notable by their absence from this list are United, Trunkline, and ANR, which had supplied 14 percent, 8 percent, and 6 percent, respectively, of this sector of the market in 1982. Even those pipelines that remain major suppliers of supplementary volumes to other pipelines experienced declines ranging from 32 to 70 percent between 1982 and 1987.

In general, these supplementary suppliers to other interstate pipeline companies have not replaced lost sales with transportation volumes. As a result of a steady downward trend since 1982 (despite a temporary recovery in 1984), 1987 transportation volumes were 31 percent lower than in 1982. Individual companies exhibited more variation from these trends than for sales volumes. For example:

- One company that departed significantly from the overall trend in transportation volumes is Texas Gas, whose 1987 volumes were 17 times their 1982 level. This reflects both a shift from sales to transportation and an overall increase of 13 percent in total deliveries to other interstate pipeline companies.
- Northwest also replaced sales with transportation volumes, and increased total deliveries to other interstate pipelines by 14 percent.
- Between 1982 and 1987, 6 of the 8 companies that experienced the largest declines in sales volumes also experienced larger decreases in transportation volumes than the 20 major pipelines as a group. (The exceptions are Enron and Transwestern, which increased transportation volumes by 70 percent and 200 percent, respectively).

The five largest suppliers to other pipelines in 1987 (based on total throughput of sales and transportation volumes) vary extensively in their mix between sales and transportation. Transportation volumes represent only 17 percent of Texas Eastern's throughput for other pipelines but 95 percent of ANR's. The other three companies in this group--Tenneco, Northwest, and Texas Gas--transport 57, 67, and 75 percent, respectively, of the gas they deliver to other interstate pipelines.

The very strong decline during the 1980's in the volumes of gas interstate pipeline companies sold to and transported on behalf of each other does not imply that pipelines have stopped doing business with one another altogether. As discussed above, some individual pipelines have actually increased the amount of gas they ship for other pipelines, particularly from Canada. Furthermore, the volumes reported in this section do not include exchange volumes or gas delivered over very short distances.

The reduction in the extent to which pipelines (with few exceptions) rely on each other as suppliers is one of the most significant effects of the gas bubble of the 1980's. Pipelines lacked markets for the large volumes of gas for which they held contracts. Furthermore, they more often than not faced substantial take-or-pay exposures if they reduced purchases from producers, since high-percentage take-or-pay clauses were commonly included in contracts for new (post-NGPA) gas. In addition, gas from other pipelines tended to be more expensive than from other supply sources. Therefore, most pipelines followed a strategy that called for reducing volumes obtained from other pipeline suppliers before cutting back on wellhead purchases. (Eventually, those pipelines affected by cutbacks from other pipelines decreased their own wellhead purchases.) Furthermore, as the industry became increasingly competitive, pipelines sought to reduce their average costs to maintain a competitive price in the marketplace. These two considerations combined provided

Table 9. Natural Gas Sales and Transportation Program Deliveries to Interstate Pipeline Companies by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
	Sales to Other Interstate Pipelines							
ANR Pipeline Co	209.9	247.8	274.0	181.1	56.5	14.1	-93	-92
CNG Transmission Corp	72.5	56.3	61.7	40.4	12.4	12.5	-83	-69
Colorado Interstate Gas Co	86.7	64.1	38.2	13.3	5.6	4.8	-95	-64
Columbia Gas Transmission	16.8	8.5	9.0	10.0	4.5	3.9	-77	-61
El Paso Natural Gas Co	1.0	1.2	1.3	1.3	0.6	0.6	-38	-53
Enron Corp	45.8	32.1	26.1	4.3	7.3	0.7	-99	-85
Florida Gas Transmission	3.5	3.6	3.2	3.2	3.4	3.8	10	19
KN Energy Inc	2.6	2.1	2.2	2.0	1.9	1.6	-39	-20
Natural Gas PL of America	46.2	28.2	29.2	23.3	5.1	0.1	-100	-100
Northwest Pipeline Co	113.0	103.0	89.5	81.2	62.5	76.7	-32	-5
Panhandle Eastern Pipe Line Co	172.5	135.2	86.2	62.6	7.6	4.8	-97	-92
Southern Natural Gas Co	105.6	53.0	30.3	25.3	14.5	12.4	-88	-51
Tenneco Inc	809.1	630.7	704.8	347.3	292.5	254.3	-69	-27
Texas Eastern Transmission	602.7	536.3	562.5	511.3	465.0	378.9	-37	-26
Texas Gas Transmission Co	328.9	261.0	251.2	179.3	108.2	98.9	-70	-45
Transco Inc	43.9	31.0	19.0	11.4	10.9	10.3	-77	-10
Transwestern Gas Pipeline	49.9	38.2	29.8	11.7	2.7	1.8	-96	-84
Trunkline Gas Co	295.8	164.2	92.0	73.1	26.2	0.8	-100	-99
United Gas Pipeline Co	476.2	354.8	329.2	147.6	28.0	0.5	-100	-100
Williams Natural Gas Co	18.5	10.9	12.2	11.2	9.9	9.6	-48	-14
Total	3,501.1	2,762.2	2,651.6	1,740.9	1,125.3	891.2	-75	-49
	Transported for Other Interstate Pipelines[a]							
ANR Pipeline Co	420.7	405.3	427.3	398.8	294.1	247.9	-41	-38
CNG Transmission Corp	10.3	15.9	18.6	24.4	15.3	8.5	-18	-65
Colorado Interstate Gas Co	85.8	62.5	68.2	74.4	59.2	22.8	-73	-69
Columbia Gas Transmission	22.6	39.0	19.2	6.2	7.2	21.3	-5	242
El Paso Natural Gas Co	101.9	124.6	127.8	162.6	165.2	120.8	19	-26
Enron Corp	78.0	156.4	133.9	124.2	127.9	132.9	70	7
Florida Gas Transmission	33.0	38.1	37.4	23.3	19.9	15.4	-54	-34
KN Energy Inc	23.5	18.6	17.9	12.9	7.5	6.4	-73	-51
Natural Gas PL of America	381.3	231.8	304.1	319.6	286.4	143.8	-62	-55
Northwest Pipeline Co	92.2	60.8	74.1	119.7	140.5	157.5	71	32
Panhandle Eastern Pipe Line Co	136.0	58.1	46.2	90.6	85.0	16.8	-88	-81
Southern Natural Gas Co	30.4	36.9	45.7	75.4	38.9	40.3	33	-47
Tenneco Inc	543.7	448.5	571.6	419.3	303.0	331.5	-39	-21
Texas Eastern Transmission	111.1	99.3	107.2	84.6	80.6	80.0	-28	-5
Texas Gas Transmission Co	17.1	95.3	131.9	150.7	185.6	291.0	b	93
Transco Inc	273.0	245.6	271.3	239.2	230.0	160.9	-41	-33
Transwestern Gas Pipeline	1.2	1.3	0.4	0.6	1.8	3.6	200	518
Trunkline Gas Co	250.8	181.3	145.4	140.4	108.0	44.0	-82	-69
United Gas Pipeline Co	102.6	96.1	109.3	75.3	40.3	25.2	-75	-67
Williams Natural Gas Co	15.0	3.5	5.6	3.8	4.3	7.9	-48	106
Total	2,730.3	2,419.0	2,663.0	2,546.0	2,036.6	1,878.2	-31	-26

[a]Transported volumes do not include exchange and compression gas transactions.
[b]Percent change greater than 1000.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

incentives for a pipeline both to reduce or eliminate supplies from other pipelines (typically more expensive than wellhead supplies) and to rely on its own system for transporting these supplies to its customers.

End-User and Marketer Transactions

The significant overall increase in interstate pipeline company business with end users since 1982 represents a major departure from the traditional movement of gas by interstate pipeline companies that mostly sold or transported supplies to other pipeline companies and LDC's for delivery to end users. The total volumes of natural gas delivered by interstate pipeline companies to end users and marketers under both sales and transportation programs more than tripled between 1982 and 1987. The volumes transported for end users by interstate pipeline companies reported as part of this discussion represent only a portion of the total gas (spot-market) transported for all end users supporting the discussion presented in Chapter 2.[10] An examination of more detailed data (Tables 10 and 11) reveals these trends:

- Total interstate volumes delivered to end users increased by 46 percent since 1982. What is even more significant about this group of customers is the shift of large volumes from sales (63 percent of their deliveries in 1982) to transportation programs (81 percent of 1987 deliveries).

- Most of the growth in deliveries to nontraditional customers may be attributed to the addition of a new class of pipeline customer, the gas marketer. None of the 20 major pipeline companies did measurable business with marketers in 1982.

Sales and Transportation to End Users

As a group, the 20 companies reduced sales and increased transportation for end users since 1982 (Table 10). Most companies shifted volumes from sales to transportation programs, but several companies delivered a lower total volume of gas to end users in 1987 than they had in 1982. Florida Gas, meanwhile, went against the overall trend by shifting volumes from transportation to sales programs, largely because it was able to sufficiently lower its weighted average cost of gas and keep its major client (Florida Power) as a system supply customer.

Direct pipeline sales to end users have always been concentrated in the hands of a few companies and have never accounted for large gas volumes. In 1982, two companies (Florida Gas and United) accounted for 61 percent of total sales. Following a sharp decline in 1983 and partial recovery in 1984, volumes sold directly to end users dropped rapidly through 1987. Two companies (Texas Gas and Trunkline) dropped out of the market altogether in 1987. Discounting Florida Gas, a special case, total volumes dropped by 78 percent. ANR, Columbia Gas Transmission (Columbia), and Texas Eastern never sold directly to end users.

The degree to which Florida Gas is unique can be seen in the fact that it accounted for 60 percent of all direct sales to end users by interstate pipeline companies in 1987. To a very large degree, the market for direct pipeline sales has become Florida Gas. Florida Gas has behaved differently from all other pipeline companies in that it has increased its sales of gas to end users while reducing its transport volumes. Florida Gas has benefitted from a unique combination of characteristics in the 1980's:

- It had a low system price of gas in the early 1980's.

- It serves a growing market composed largely of industrial and electric utility customers.

- It has a monopoly over gas supplies to its market.

Florida Gas has a market position that allowed it to experience growing markets for its system gas. As a result, the company has shown less interest in adopting open-access transportation programs than any other pipeline, and, of all States in the country, Florida remains closer to the traditional natural-gas market structure. Nevertheless, the pipeline began to alter its position, for in late 1988 it submitted a request to the FERC for open-access status under Order 500.

[10]The proportion of end-user transportation reported by the major interstate pipeline companies (Table 10) constitutes only about 27 percent of that delivered to all end users in 1987 (Table 6).

Table 10. Natural Gas Sales and Transportation Program Deliveries to End Users by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
	Sales to End Users							
ANR Pipeline Co	0.0	0.0	0.0	0.0	0.0	0.0	--	--
CNG Transmission Corp	0.0	0.0	0.0	16.2	3.2	9.8	--	-39
Colorado Interstate Gas Co	11.8	6.5	25.7	16.5	8.8	4.9	-58	-70
Columbia Gas Transmission	0.0	0.0	0.0	0.0	0.0	0.0	--	--
El Paso Natural Gas Co	47.2	40.9	43.1	49.7	9.1	5.9	-88	-88
Enron Corp	36.7	40.1	67.4	45.7	11.7	16.3	-56	-64
Florida Gas Transmission	116.5	114.2	122.2	120.0	139.5	151.8	30	27
KN Energy Inc	10.4	8.4	9.7	7.2	3.2	2.5	-76	-66
Natural Gas PL of America	9.3	8.1	9.0	9.0	3.4	0.9	-90	-90
Northwest Pipeline Co	2.3	2.5	3.0	3.6	2.4	4.9	116	37
Panhandle Eastern Pipe Line Co	25.5	25.7	21.7	17.2	15.2	6.8	-73	-60
Southern Natural Gas Co	31.4	30.1	32.7	26.1	13.3	5.2	-83	-80
Tenneco Inc	1.4	1.4	1.7	1.6	1.7	1.5	8	-3
Texas Eastern Transmission	0.0	0.0	0.0	0.0	0.0	0.0	--	--
Texas Gas Transmission Co	1.9	1.6	2.1	1.6	0.8	0.0	-99	-99
Transco Inc	1.6	1.4	1.5	1.0	1.7	1.1	-33	6
Transwestern Gas Pipeline	0.1	0.1	0.1	0.3	0.3	0.2	46	-32
Trunkline Gas Co	0.1	0.1	0.6	2.0	0.1	0.0	-64	-98
United Gas Pipeline Co	232.2	101.9	106.1	100.2	46.3	30.0	-87	-70
Williams Natural Gas Co	39.2	28.3	47.4	55.1	37.6	11.1	-72	-80
Total	567.6	411.3	493.8	472.7	298.3	252.9	-55	-47
	Transported for End Users[a]							
ANR Pipeline Co	0.5	10.1	57.8	63.5	48.0	93.8	b	48
CNG Transmission Corp	0.0	0.0	4.0	4.6	7.0	35.2	--	657
Colorado Interstate Gas Co	5.7	8.1	8.0	7.0	6.5	62.4	b	796
Columbia Gas Transmission	3.4	3.5	45.9	38.8	40.5	79.8	b	106
El Paso Natural Gas Co	36.5	34.6	127.2	87.7	106.4	128.5	253	47
Enron Corp	10.7	9.0	63.5	64.5	67.4	107.7	909	67
Florida Gas Transmission	71.8	68.4	58.3	50.7	39.8	27.2	-62	-46
KN Energy Inc	0.1	0.0	0.1	1.9	1.4	1.5	b	-25
Natural Gas PL of America	0.0	4.1	27.4	94.1	41.4	130.1	--	38
Northwest Pipeline Co	8.1	6.6	9.3	5.7	5.4	26.8	233	373
Panhandle Eastern Pipe Line Co	15.4	20.4	20.9	52.5	30.6	36.4	136	-31
Southern Natural Gas Co	9.1	12.2	11.9	10.3	9.6	9.7	6	-6
Tenneco Inc	38.3	48.1	75.0	67.7	55.6	73.2	79	8
Texas Eastern Transmission	17.8	1.4	1.7	8.3	1.2	1.1	-94	-86
Texas Gas Transmission Co	15.1	12.8	19.7	17.9	7.4	11.1	-27	-38
Transco Inc	24.1	24.0	27.8	28.4	30.3	41.2	71	45
Transwestern Gas Pipeline	0.0	0.0	0.0	0.0	0.0	18.8	--	--
Trunkline Gas Co	62.8	39.6	79.3	101.6	102.9	95.3	52	-6
United Gas Pipeline Co	18.3	18.5	19.3	33.0	39.1	82.7	352	150
Williams Natural Gas Co	0.0	1.9	14.8	0.0	0.0	6.4	--	--
Total	337.7	323.4	671.9	738.2	640.5	1,068.2	216	45

[a]Transported volumes do not include exchange and compression gas transactions.
[b]Percent change greater than 1000.
-- = Not applicable.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

Table 11. Natural Gas Transportation Program Deliveries to Natural Gas Marketers by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
ANR Pipeline Co	0.0	0.0	0.4	28.9	48.2	92.7	--	220
CNG Transmission Corp	0.0	0.0	0.0	0.0	0.0	0.0	--	0
Colorado Interstate Gas Co	0.0	0.0	0.0	8.6	23.7	74.8	--	255
Columbia Gas Transmission	0.0	0.0	22.1[a]	44.5[a]	0.0	0.0	--	--
El Paso Natural Gas Co	0.0	0.0	0.0	0.0	37.5	110.2	--	--
Enron Corp	0.0	0.0	0.0	1.8	6.9	65.2	--	b
Florida Gas Transmission	0.0	0.1[a]	0.0	0.9	6.4	0.0	--	--
KN Energy Inc	0.0	0.0	0.0	0.0	0.0	0.0	--	0
Natural Gas PL of America	0.0	0.0	0.0	16.5	103.2	536.7	--	b
Northwest Pipeline Co	0.0	0.0	0.0	0.0	11.8	40.5	--	--
Panhandle Eastern Pipe Line Co	0.0	0.0	0.0	7.2	9.4	38.5	--	438
Southern Natural Gas Co	0.0	0.0	0.0	0.0	0.0	0.0	--	0
Tenneco Inc	0.0	1.2[a]	6.4[a]	166.8	256.3	358.2	--	115
Texas Eastern Transmission	0.0	0.0	0.0	16.6	25.4	19.9	--	20
Texas Gas Transmission Co	0.0	0.0	0.0	16.1	18.1	43.1	--	167
Transco Inc	0.0	34.2[a]	0.0	14.3	30.0	70.2	--	391
Transwestern Gas Pipeline	0.0	0.0	0.0	0.0	17.8	42.9	--	--
Trunkline Gas Co	0.0	0.0	0.0	5.5	23.4	9.8	--	78
United Gas Pipeline Co	0.0	0.0	0.0	47.3	163.0	247.1	--	423
Williams Natural Gas Co	0.0	0.0	0.0	11.7	6.0	51.1	--	338
Total	0.0	35.5	28.8	390.8	787.3	1,800.9	--	361

[a]Special Marketing Program -- volumes for specific clients unavailable and therefore the volumes are included here rather than as transported for end users (Table 10) or LDC's (Table 12).
[b]Percent change greater than 1000.
-- = Not applicable.
Note: Transportation volumes do not include exchange and compression gas transactions.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

All 20 companies currently transport gas for end users, and all but 4 companies--CNG Transmission Corporation, Natural, Transwestern, and Williams Natural Gas Company (Williams)--have been doing so at least since 1982. The volumes transported for this market sector have more than tripled since 1982. But the trend has been neither steady nor universal. In many ways, the development of this market sector largely reflects its nature. Most volumes are purchased in spot-market transactions, and only when the price is competitive with the price of other supplies (either system supply or an alternative fuel). Further, given its obligation to serve firm system customers, a pipeline would only agree to transport spot-market supply when it has excess system capacity, which varies depending on system demand. Finally, regulatory and legal uncertainties dampened the enthusiasm with which companies adopted open access. Order 436, which encountered court challenges, was replaced by Order 500, to which several amendments were added for clarification. Several companies have yet to become open-access transporters. None of the three companies that reduced transport volumes for end users between 1982 and 1987 provided open-access transportation in this time frame.

The transport market is much less concentrated than sales. The five largest transporters of gas to end users in 1987--Natural, El Paso Natural Gas Company, Enron, Trunkline, and ANR--shipped 52 percent of the total, compared with the single largest supplier of sales gas (Florida Gas), which shipped 60 percent of sales deliveries to end users.

Transportation for Marketers

Fifteen of the twenty companies transported gas for marketers in 1987. Three companies (Natural, Tenneco, and United) accounted for 63 percent of the total volume transported for marketers (Table 11). Natural apparently shifted at least some of its LDC and intrastate pipeline sales to marketer transportation programs, since direct sales to end users have never been a major part of the company's business and volumes shipped under LDC, intrastate pipeline, and end-user transportation programs also increased in 1987. For Tenneco and United, increasing transportation for marketers represents a net increase in pipeline shipments, since both companies also increased their total deliveries to LDC and intrastate customers and end users in 1987. Tenneco, however, delivered relatively less gas to end users than either Natural or United. For United, transportation gas for end users and marketers has probably substituted for the direct sales that United has lost during the past 6 years.

The growth in providing transportation services for marketers has been explosive. In 1987, interstate pipeline companies transported 1,801 billion cubic feet (Bcf) for gas marketers. This is 36 percent more gas than they delivered to all end users under direct sales and transportation programs combined, and nearly one-fifth the amount they delivered to intrastate pipelines and LDC's. This trend is not universal, however. In addition to the companies that have yet to enter this newest market sector, one company (Columbia) withdrew after a two-year experimentation under its Special Marketing Program (SMP) during 1984 and 1985. However, two other companies with early experience with SMP's--Tenneco and Transco Incorporated (Transco)--have since expanded their transportation programs for marketers. Tenneco was the second largest transporter for marketers in 1987, shipping over 358 Bcf (20 percent of the total).

During the 1980's, interstate pipeline company business with end users and gas marketers has grown dramatically. Initially, much of the growth came from programs that were conceived to be temporary: off-system sales and SMP's. However, the volume of gas transported for end users and marketers has continued to grow through 1987, and it is clear that they are likely to be a major part of the market for interstate pipeline company services for the foreseeable future. For an individual company, however, the extent to which that happens varies according to its specific situation.

LDC and Intrastate Pipeline Transactions

Sales to intrastate pipeline companies and LDC's have traditionally comprised the largest part of the business for the interstate pipeline industry as a whole. Although many sales to intrastate pipelines and LDC's have now been displaced by transportation arrangements, the business base for most interstate pipelines continues to rest with these customers (the exception of course being those pipelines, discussed above, that mainly ship gas from offshore and other producing regions to other interstate pipelines). Largely for this reason, volumes sold and transported to these customers are fairly well distributed among the 20 companies (Tables 12 and 13). This contrasts with deliveries to other interstate pipelines, end users, and especially brokers, which tend to be concentrated among only a few companies.

Despite the relative stability in terms of total deliveries to intrastate pipelines and LDC's by all 20 companies as a group (1987 volumes were only 3 percent above 1982 volumes and year-to-year changes in volume never exceeded 10 percent), individual interstate pipelines have changed the way they serve LDC's considerably since 1982. In 1987, some pipeline companies (ANR, Texas Eastern, United, and Enron) delivered substantially more gas to intrastate pipelines and LDC's than they did in 1982, while others (Natural and Southern) delivered substantially less. Whereas Natural has begun to transport gas for marketers, some of which may still be going ultimately to its intrastate and LDC customers, Southern apparently has experienced a real decline in its volumes, since it has not yet begun to transport for marketers.

Although the changes in total volumes delivered to intrastate pipelines and LDC's have been striking for some individual pipelines, in some instances the changes are not as dramatic as they appear. United, for example, not only appears to have shifted many of its former LDC and intrastate pipeline sales to transportation programs, but also nearly doubled total deliveries to these customers between 1982 and 1987. Much of this overall increase, however, is apparently because of increases in deliveries to intrastate pipelines (including some that United has set up itself) rather than to the traditional LDC market.

Regardless of the direction of total deliveries, the proportion of gas delivered under sales versus transportation programs has changed for most pipelines.

Table 12. Natural Gas Sales and Transportation Program Deliveries to Intrastate Pipelines and LDC's by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
	Sales to Intrastate Pipelines and LDC's							
ANR Pipeline Co	337.3	306.5	317.0	316.5	254.0	151.3	-55	-52
CNG Transmission Corp	468.4	422.0	463.1	419.1	253.0	163.9	-65	-61
Colorado Interstate Gas Co	205.2	197.6	192.9	173.4	123.0	107.7	-48	-38
Columbia Gas Transmission	909.9	754.8	629.0	600.7	465.8	377.9	-58	-37
El Paso Natural Gas Co	967.5	830.0	895.4	830.7	397.0	281.8	-71	-66
Enron Corp	510.9	466.6	467.0	455.2	455.5	397.0	-22	-13
Florida Gas Transmission	69.2	76.2	79.7	77.9	74.0	83.6	21	7
KN Energy Inc	27.0	25.3	28.5	27.0	21.5	21.1	-23	-22
Natural Gas PL of America	896.7	860.5	898.8	836.0	510.0	194.8	-78	-77
Northwest Pipeline Co	161.1	151.4	172.4	169.9	120.0	114.9	-29	-32
Panhandle Eastern Pipe Line Co	406.7	313.8	307.4	252.0	216.9	112.7	-72	-55
Southern Natural Gas Co	389.0	406.3	406.6	353.5	228.0	154.5	-60	-56
Tenneco Inc	223.7	231.4	261.4	203.0	181.4	165.4	-26	-19
Texas Eastern Transmission	275.7	343.5	397.0	274.8	254.1	271.1	-2	-1
Texas Gas Transmission Co	286.8	271.1	286.3	248.5	122.0	92.3	-68	-63
Transco Inc	890.7	790.6	717.9	549.0	352.5	385.5	-57	-30
Transwestern Gas Pipeline	240.2	239.4	220.9	206.0	115.3	114.4	-52	-45
Trunkline Gas Co	220.2	141.3	183.0	135.6	177.0	159.4	-28	18
United Gas Pipeline Co	156.7	129.7	121.0	117.4	75.5	69.7	-56	-41
Williams Natural Gas Co	222.8	208.2	211.6	212.7	192.0	167.8	-25	-21
Total	7,866.5	7,167.0	7,257.0	6,460.4	4,592.7	3,587.0	-54	-44
	Transported for Intrastate Pipelines and LDC's[a]							
ANR Pipeline Co	15.3	64.2	98.7	110.6	213.2	395.5	b	258
CNG Transmission Corp	4.0	3.8	7.9	22.9	126.7	216.0	b	845
Colorado Interstate Gas Co	2.0	2.0	11.1	9.7	36.7	70.0	b	619
Columbia Gas Transmission	11.5	31.5	82.8	239.4	334.9	478.0	b	100
El Paso Natural Gas Co	22.4	47.5	76.4	141.7	357.0	510.6	b	260
Enron Corp	41.0	107.0	178.0	247.2	195.2	533.9	b	116
Florida Gas Transmission	3.5	8.9	10.9	9.4	16.8	2.7	-22	-71
KN Energy Inc	6.2	10.0	6.6	6.3	6.4	2.3	-62	-63
Natural Gas PL of America	38.1	63.3	56.7	87.0	110.7	249.4	554	187
Northwest Pipeline Co	34.7	34.1	37.6	56.0	74.1	68.0	98	23
Panhandle Eastern Pipe Line Co	13.1	55.4	70.4	107.9	135.3	220.2	158	104
Southern Natural Gas Co	14.7	23.6	18.2	56.1	85.6	72.1	390	29
Tenneco Inc	41.0	80.6	103.8	103.5	80.3	169.0	304	63
Texas Eastern Transmission	7.6	17.1	34.3	94.4	171.7	286.8	366	204
Texas Gas Transmission Co	1.2	15.2	38.9	70.7	44.4	249.1	b	252
Transco Inc	60.1	86.7	222.0	361.5	634.5	821.5	b	127
Transwestern Gas Pipeline	0.1	0.0	0.0	52.1	96.4	110.9	b	113
Trunkline Gas Co	25.9	22.8	35.4	78.0	155.6	143.1	451	82
United Gas Pipeline Co	42.1	53.5	136.3	177.3	219.2	313.3	643	77
Williams Natural Gas Co	0.3	6.0	19.5	50.1	52.0	26.7	b	-47
Total	385.7	733.5	1,245.0	2,098.7	3,146.8	4,940.3	b	127

[a]Transported volumes do not include exchange and compression gas transactions.
[b]Percent change greater than 1000.
-- = Not applicable.
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

Table 13. Total Natural Gas Deliveries to Intrastate Pipelines and LDC's by 20 Major Interstate Pipeline Companies, 1982-1987
(Volume in Billion Cubic Feet)

Company	Annual Deliveries						Percent Change 1982-1987	Percent Change 1985-1987
	1982	1983	1984	1985	1986	1987		
ANR Pipeline Co	352.6	370.7	415.6	427.1	467.0	546.7	55	28
CNG Transmission Corp	472.4	426.8	471.0	442.0	380.0	380.0	-20	-14
Colorado Interstate Gas Co	207.2	199.6	204.0	183.1	159.0	177.7	-14	-3
Columbia Gas Transmission	921.4	786.3	711.0	840.1	800.6	856.4	-7	2
El Paso Natural Gas Co	989.9	877.4	971.8	972.4	754.0	792.4	-20	-19
Enron Corp	551.0	573.6	645.4	702.3	650.6	930.8	69	33
Florida Gas Transmission	72.7	85.1	90.6	87.4	90.8	86.3	19	-1
KN Energy Inc	33.0	35.5	35.1	33.4	27.9	23.4	-30	-30
Natural Gas PL of America	934.8	923.9	955.5	923.0	620.6	444.2	-52	-52
Northwest Pipeline Co	195.9	185.4	210.0	226.0	194.0	183.6	-6	-19
Panhandle Eastern Pipe Line Co	419.8	369.2	377.8	360.0	352.2	332.8	-21	-8
Southern Natural Gas Co	403.7	429.9	424.8	409.6	314.0	226.7	-44	-45
Tenneco Inc	265.0	311.9	365.2	307.0	261.7	334.5	26	9
Texas Eastern Transmission	283.3	360.6	431.0	389.2	425.8	557.9	97	51
Texas Gas Transmission Co	288.0	286.3	325.2	319.2	167.3	341.0	19	7
Transco Inc	950.8	877.3	939.0	910.6	987.0	1207.0	27	33
Transwestern Gas Pipeline	240.3	239.4	220.9	258.0	211.7	225.3	-6	-13
Trunkline Gas Co	246.2	164.1	218.4	214.3	333.6	302.0	23	41
United Gas Pipeline Co	198.8	183.3	257.3	294.7	294.7	383.0	93	30
Williams Natural Gas Co	223.1	214.2	231.1	262.8	244.0	194.5	-13	-26
Total	8,252.1	7,900.0	8,503.0	8,559.1	7,739.5	8,527.2	-	0

Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

Sales to Intrastate Pipelines and LDC's

Sales to intrastate pipelines and LDC's remain an important part of business for almost all the traditional interstate pipelines. All but 4 of the 20 major pipelines--Florida Gas, KN Energy Incorporated (KN Energy), Texas Gas, and United--reported selling at least 100 billion cubic feet of gas to these customers in 1987. Nonetheless, there have been major changes in the importance of the sales for resale market for many companies. Only Florida Gas has increased its sales volumes (for reasons noted above), and Texas Eastern retained most of its sales market intact. The declines for all other companies between 1982 and 1987 range from 22 percent (Enron) to 78 percent (Natural).

For most companies, the decline in sales was offset by increases in transportation volumes. As a result, the share of deliveries to intrastate pipeline companies and LDC's under sales programs declined from 95 percent of deliveries to these customers in 1982 to 42 percent in 1987. Compared with trends for other types of customers, the shift since 1982 has been the most dramatic for intrastate pipelines and LDC's. Nevertheless, the proportion of gas delivered under sales programs in 1987 was higher for intrastate pipelines and LDC's than for either end users or interstate pipeline companies.

Transportation for Intrastate Pipelines and LDC's

Almost all the major interstate pipeline companies have experienced a rapid growth in the volumes of gas they transport for intrastate pipelines and LDC's. In 1982, only one pipeline shipped more than 50 Bcf (Transco) to intrastate pipelines and LDC's under transportation programs, and 8 of the 20 companies shipped less than 10 Bcf. By 1987, all but 3 of the 20 companies transported at least 50 Bcf for these customers.

United, Enron, and Transco exploited the transportation market sooner and more thoroughly than other companies, establishing themselves as the leaders in the transport market since at least 1984. They have been joined since 1985 by several other companies, most notably Columbia. Beginning in 1983, Columbia has taken the lead in the industry in several regards. The company was the first to introduce SMP's, and the first (1985) to attempt a comprehensive settlement of its take-or-pay difficulties, and the first to become an open-access transporter. Beginning in 1985, Columbia became one of the leading transporters by volume.

Despite the overall upward trend, two companies--Florida Gas (a special case) and KN Energy (a small company)--transported smaller volumes for intrastate pipelines and LDC's in 1987 than they had in 1982. In addition, the volumes that Williams transported for these customers were cut in half during 1987, while volumes transported by three other companies (Northwest, Southern, and Trunkline) declined less dramatically in that year.

These results suggest that there was not a single market strategy in the mid-1980's that was required to maintain or increase business with LDC's. Companies with a history of relatively expensive wellhead purchases (for example, Enron and Transco) could maintain their market share by shifting aggressively to transportation programs. Other companies with relatively less expensive gas traditionally (Texas Eastern, Florida Gas) could maintain sales levels.

The Effect of Take-or-Pay

One of the most important forces affecting interstate pipeline companies in the 1980's has been the accumulation of high take-or-pay exposures. Take-or-pay provisions in wellhead purchase contracts require the buyer to pay for gas even if the buyer is unable to receive or resell it. Beginning in 1983, some pipeline companies faced sales markets in which major customers were unwilling to purchase gas at the above-market prices in pipeline contracts with producers. As a result, those pipelines that did not purchase the full volume of gas covered by these contracts built up potential take-or-pay obligations--totaling billions of dollars for some companies. Later, other pipelines that had been spared the first round of take-or-pay buildups encountered problems.

Transportation programs appeared attractive to pipeline companies with take-or-pay problems during the early 1980's. Under some early transportation arrangements, producers were allowed to sell spot-market gas only if they credited the delivered volumes against the pipeline company's take-or-pay obligations. Regardless of the arrangement, transportation programs for shipping market-priced spot gas allowed pipelines to maintain or increase throughput, thereby improving overall earnings.

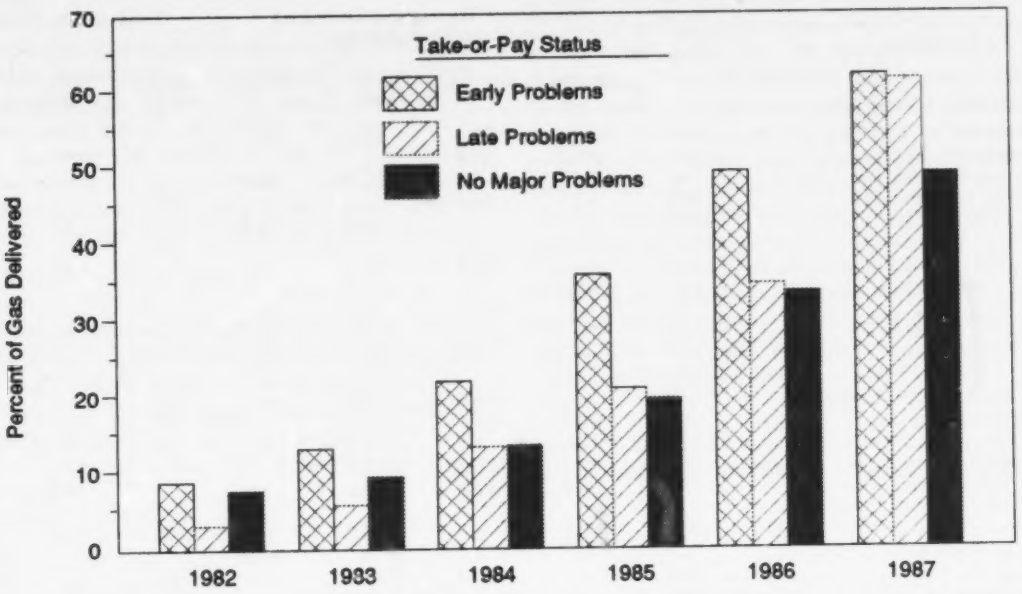
Available data suggest that the existence of take-or-pay problems has contributed to the degree to which pipeline companies have adopted transportation programs (Figure 6). Three groups of companies have been identified according to the nature of their take-or-pay problems.[11] These are: Companies that developed problems in 1985 or earlier; companies that developed problems after 1985; and companies that experienced no major take-or-pay problems. For purposes of assigning each of the 20 major companies in this study to an appropriate group, a company is considered to have a major take-or-pay problem if it had take-or-pay exposure of $350 million or more by the time indicated. Table 14 indicates which companies have been included in each group.

Companies with early take-or-pay problems expanded their use of transportation agreements earlier than those with either later or no take-or-pay problems. In each year from 1982 to 1987, the group of seven companies that encountered early take-or-pay problems shipped a higher percentage of their total deliveries to LDC's and end users via transportation agreements than either of the other two groups.

The relationship between a company's take-or-pay status and its use of transportation agreements is less clear-cut for companies developing problems after 1985. The four companies that did not encounter a major take-or-pay problem until after 1985 ship no more gas, on a percentage basis, under transportation programs than do the nine companies with no significant problems. As a result, differences among the three groups have become less pronounced. In 1987, all three groups of companies were

[11] Energy Information Administration, "Overview of Pipeline Take-or-Pay Exposure: 1983-1987," *Natural Gas Monthly*, April 1988. DOE/EIA-0130 (88/04). Washington DC, July 1988.

Figure 6. Percent of Gas Delivered to LDC's and End Users in Transportation Programs, by Take-or-Pay Status, 1982-1987



Sources: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies," and Securities and Exchange Commission Filings 10-K and 10-Q.

shipping at least 50 percent of their deliveries to LDC's and end users under transportation agreements.

Clearly, the interstate pipeline companies developed transportation programs for many other reasons besides the existence of a take-or-pay problem. The trend for companies with no history of take-or-pay difficulties indicates the extent to which transportation services have become established in a pipeline's business for these other reasons. Companies with no major take-or-pay problems nonetheless apparently had more choices as to how they adapted to the interstate natural gas marketplace of the late 1980's.

Regional Differences

Chapter 2 examined the differences among States and Census Divisions in the degree to which end users obtained gas under transportation programs. In Chapter 2, volumes delivered by interstate pipelines directly to end users were included along with deliveries by intrastate pipelines and LDC's. This section examines the extent of regional variation for transportation program deliveries by the interstate pipelines.

The share of volumes delivered by interstate pipeline companies under transportation programs has increased in each region since 1982 (Figures 7 and 8). However, the interstate pipelines serving different regions (see Table 14) differ in the degree to which they deliver gas under transportation programs. For example:

- Interstate pipelines serving the Southwest ship the highest proportion of gas under transportation programs. Even though the region obtains supplies from producers within the region, a sizable proportion of these shipments are carried by interstate pipelines that serve this market either primarily or along routes to other regions of the country. For instance, almost 80 percent of United's deliveries are to customers within the Southwestern States, and the remainder goes

Table 14. Major Service Areas and Take-or-Pay Status of 20 Major Interstate Pipeline Companies, 1987
(Volume in Billion Cubic Feet)

Company	Throughput Volume[a]	Percent of Throughput Delivered to Major Market Areas[b]				Take-or-Pay Problem		
		Eastern	Central	Southwest	Western	Before 1986	After 1985	Little or None
ANR Pipeline Co	996	c	74.3	25.6	--			XX
CNG Transmission Corp	446	68.8	31.2	--	--			XX
Colorado Interstate Gas Co	342	--	16.2	29.6	54.2			XX
Columbia Gas Transmission	989	63.7	36.3	--	--	XX		
El Paso Natural Gas Co	1,152	--	--	28.5	71.5		XX	
Enron Corp	1,114	--	68.5	30.8	c		XX	
Florida Gas Transmission	284	93.4	--	6.6	--			XX
KN Energy Inc	86	--	49.1	27.8	23.0			XX
Natural Gas PL of America	1,254	c	57.3	39.1	2.4		XX	
Northwest Pipeline Co	495	--	--	--	100.0			XX
Panhandle Eastern Pipe Line Co.	443	--	94.6	4.7	c	XX		
Southern Natural Gas Co	295	86.6	--	13.4	--	XX		
Tenneco Inc	1,352	71.6	c	27.7	--	XX		
Texas Eastern Transmission	1,039	62.1	22.3	15.6	--			XX
Texas Gas Transmission Co	779	26.9	49.2	23.9	--		XX	
Transco Inc	1,490	79.6	c	20.2	--	XX		
Transwestern Gas Pipeline	292	--	--	c	99.3			XX
Trunkline Gas Co	452	c	60.4	39.3	--	XX		
United Gas Pipeline Co	760	21.6	--	78.4	--	XX		
Williams Natural Gas Co	280	--	94.1	3.0	2.9			XX

[a]Does not include exchange gas, gas used by respondent, gas delivered to storage, gas transported by others, and other miscellaneous deliveries.
[b]Percent based on 1987 pipeline throughput volumes of "Sales for Resale," "Main Line Sales," and "Transportation for the Account of Others."
[c]Less than 1 percent.
-- = Not applicable.
Sources: •Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies." •Securities and Exchange Commission Filings 10-K and 10-Q.

primarily to Florida. Natural and Trunkline are also major participants in the Southwest delivery infrastructure. It is not surprising that a company such as United, with such a large interest in the Southwestern region, an area where transportation programs (as an alternative to high-cost system supply purchasing) have developed rapidly, has almost ceased being a wholesaler for natural gas. United is on the verge of becoming a pure transporter as competition among delivery alternatives in the area has forced it to adapt to new market realities.

- Pipelines serving the Eastern United States got the earliest start in large-volume transportation programs through such marketing tools as the Special Marketing Programs. Through 1986, they consistently shipped a higher proportion of transport gas on an individual pipeline basis than pipelines serving any other consuming region.

- Pipelines serving the Central United States outpaced those in the Eastern States in 1987, when they shipped more than 56 percent of their supplies to this region under transportation rather than sales programs.

- Pipelines serving the Western United States have been the slowest to adopt transportation programs for shipping large shares of their throughput. Initially, they had a higher share of transport deliveries than the Central United States, but they lagged behind as pipelines in other areas expanded their transportation programs. In 1986, they once

again shipped a higher percentage of their throughput under transportation programs than the group of pipelines serving the Central United States.

The relatively late start in the Western United States may be caused by California's domination of this regional market. Recent efforts by the California Public Utilities Commission systematically encourage the large LDC's (Southern California Gas and Pacific Gas and Electric) to use the spot market for gas purchases. These efforts may lag behind programs in other parts of the country at least partly because of the State's effort to protect its core customers.

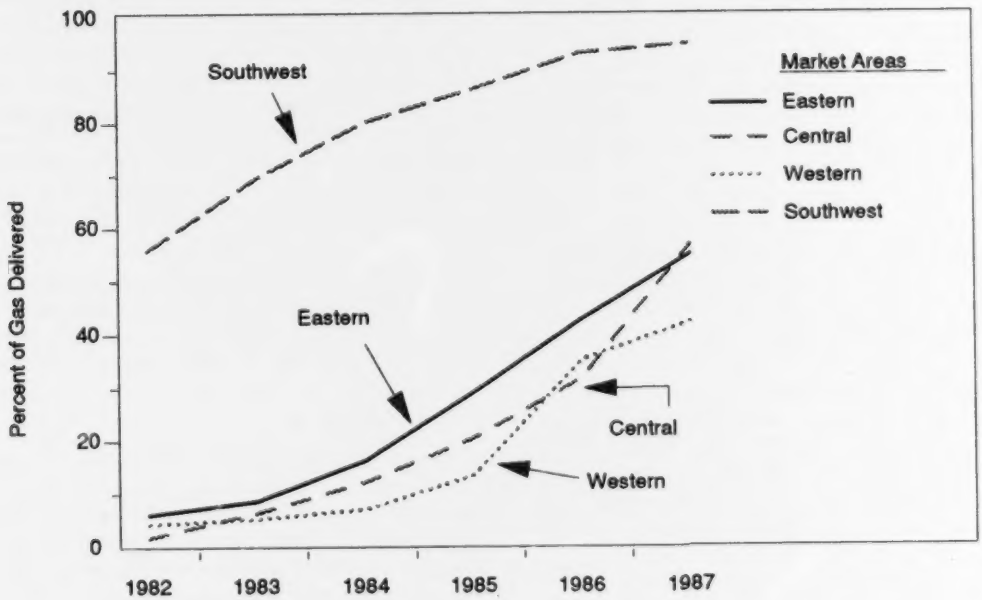
The popularity of transportation programs among pipelines serving the Eastern United States may be related to the relatively high prices many of these pipelines have historically paid for system supply. This made alternative supplies such as from the spot market relatively more attractive to end users and LDC's served by these pipelines.

Summary

Despite the overall trends identified in Chapter 2, the growth of new transportation markets has not proceeded at a universal pace for all major interstate pipeline companies. Part of the variation may be due to differences in the types of customers served by the pipelines. Some pipelines traditionally served primarily as transporters for other pipelines. Others have a larger base of industrial and electric utility customers, which basically defines the limits of the transportation volumes that potentially may be shipped to end users. Most have traditionally shipped large volumes to intrastate pipelines and LDC's, whose supply strategies are constrained by regulatory policies governing transportation programs that vary widely from State to State. This may partially explain the extensive regional variations identified at the end of this chapter.

Many of the differences among pipeline companies may reflect their different histories. Pipelines historically have

Figure 7. Percent of Gas Delivered by 20 Major Interstate Pipeline Companies to LDC's and End Users in Transportation Programs, by Major Market Area, 1982-1987

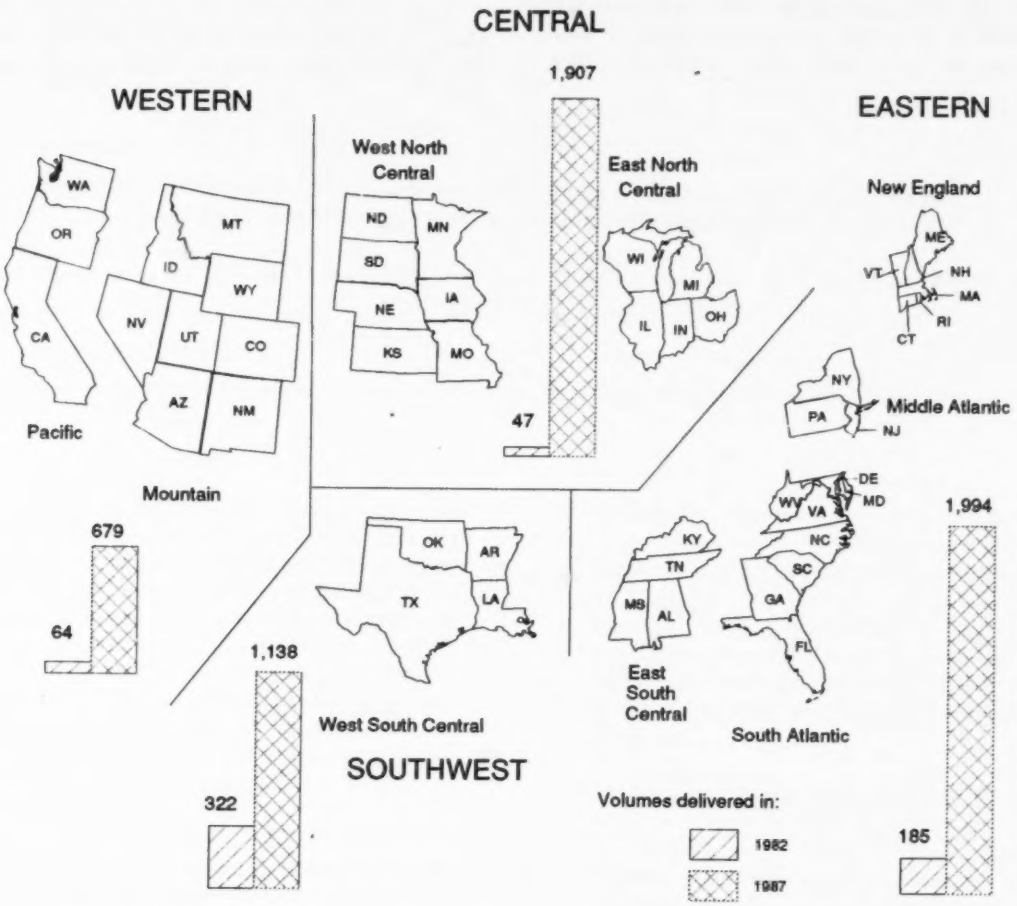


Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

operated in markets that emphasize their differences. Furthermore, prior to the decontrol of wellhead markets, differences in the mix of wellhead supplies explained much of the variation among pipeline companies. Now, differences in other areas, such as capital structure or take-or-pay exposure, determine a company's market possibilities and influence its choice of strategies. Such historical differences continue to influence a pipeline's behavior over long periods of time, so that even in a relatively free market, they constrain choices available to particular companies and place a limit on the extent to which pipelines may pursue a common strategy.

Given the fact that overall increases in transportation program volumes continued through 1987, and individual pipelines that started later than others still have much room for further expansion of these programs, the shift from sales to transportation programs is not yet total. Yet, decreases reported by several pipelines in recent years may suggest that there may be limits on the extent to which these programs may expand. Some of the considerations likely to affect the future direction of pipeline transportation programs are examined in the following chapter.

Figure 8. Gas Delivered by 20 Major Interstate Pipeline Companies to LDC's and End Users via Transportation Programs, by Major Market Areas, 1982 and 1987



Note: Volume in Billion Cubic Feet
Source: Federal Energy Regulatory Commission, Form 2, "Annual Report of Major Natural Gas Companies."

4. Competitive Forces in the Emerging Transportation Services Sector

The remarkable growth in the transportation services sector reflects, to some extent, the industry response to three major developments of the 1980's: the gas surplus, the drop in the world oil prices, and regulatory initiatives promoting open-access transportation by interstate pipelines. As a result, pipelines were faced with commitments to take, or pay for, more gas production than system customers were willing to purchase at their weighted average cost of gas (WACOG). (The WACOG is calculated as the total cost of all gas purchased by the pipeline during a base period divided by the system throughput of owned-gas only during the same period.)

In order to maintain throughput at levels sufficient to recover fixed costs, pipelines found they needed to compete with other fuels, and sometimes with one another. The traditional market and regulatory structure, and pipeline purchasing strategies, however, limited the extent to which they could reduce the price of system supply in response to market signals. For example, large volumes of gas for the system supply portfolios of most pipelines came from long-term contracts with inflexible pricing provisions. Contracts often included additional terms that required the pipelines to take, or pay for, specified quantities of gas, at prices that later proved to be out of line with the market conditions that developed during the 1980's. In addition, regulatory requirements limited the extent to which the pipelines could lower prices at which gas was sold to customers with the capability to switch to other fuels or add new service.

The early transportation programs provided a mechanism by which customers who otherwise may have switched to other fuels could obtain access to the lower-priced gas on the spot market. This consideration took on increasing importance when oil prices collapsed in early 1986.

This chapter discusses the structure of transportation markets and examines the two main types of competition encountered by interstate pipelines during the 1980's: competition from other fuels and competition from other pipelines. First, however, it is helpful to review price trends that provide some indication of the types of competition at work in the interstate natural-gas marketplace.

Price Developments of the 1980's

A major impetus for the adoption of transportation programs was the inability of system-supply prices to respond adequately to market signals associated with the gas surplus and falling oil prices. A comparison of the price of interstate pipeline company system supply relative to the major alternatives to system supply over the 1982 through 1988 period (Table 15) provides certain insights into market conditions.

- The average price paid by interstate pipeline companies for gas purchased from all sources consistently averaged above other natural gas prices shown on Table 15. This includes both wellhead purchases and purchases from other pipelines.

- The decline in prices paid by interstate pipeline companies for system supply has been less dramatic than the declines in prices for spot-market purchases and new long-term supply contracts. Between 1984 and 1988, the average price of all gas purchased by interstate pipelines declined by 39 percent, while the prices of spot and new long-term contract gas declined by at least 50 percent. This reflects the traditional purchasing practices of pipelines, which include a mix of long-term contracts that generally contain inflexible pricing provisions--some of which included high prices and/or take-or-pay provisions.

- Spot prices meanwhile followed a steady downward trend through mid-1987, increased during the 1987-88 heating season, and have restarted their generally upward movement since mid-1988 (Figure 9). Although differences in the availability of spot gas in each producing region result in price differences from one region to another (for example, Appalachian spot gas is typically the most expensive and Rocky Mountain spot gas the least expensive), all regional prices have followed this same basic pattern.

Table 15. Selected Energy Price Levels, 1982-1988
(Constant 1988 Dollars per Thousand Cubic Feet)

Year	Average U.S. Natural Gas Wellhead Price	Interstate Natural Gas Pipeline				Natural Gas Contract Prices[a]		Residual Fuel Oil[c] Average Price to End Users
		Average Wellhead Price	Average All Purchased Gas (WACOG)	Average[b] Long-term New Contracts PGA	Average Transport Fee	New Long-term Contracts	Spot Contract Price	
1982	3.02	3.40	3.73	3.51	0.24	--	--	6.29
1983	3.06	3.47	3.85	3.27	0.34	--	--	5.48
1984	3.03	3.31	3.57	2.31	0.29	3.36	3.33	5.64
1985	2.77	3.11	3.32	2.25	0.29	3.02	2.64	4.87
1986	2.08	2.56	2.78	2.31	0.32	2.05	1.72	2.76
1987	1.74	2.23	2.41	2.15	0.28	2.06	1.50	3.22
1988[d]	1.71	2.03	2.19	2.15	0.25	1.68	1.60	2.55

[a]Unweighted average price levels. (See Appendix A.)
[b]Weighted average price based on projected purchases reported for purchased gas adjustment contracts effective during the filing year.
[c]Sulfur content less than or equal to 1 percent. Price converted from dollars per gallon to dollars per thousand cubic feet using conversion factors available in the EIA *Monthly Energy Review*.
[d]Through third quarter (September) of 1988.
WACOG = Weighted Average Cost of Gas (Purchases).
Sources: •Overall Average U.S. Wellhead Price: Energy Information Administration, *Natural Gas Monthly*. •Interstate Wellhead and System Weighted Prices and Transport Fees: Federal Energy Regulatory Commission, Form 11, "Natural Gas Pipeline Company Monthly Statement." •Interstate Long-term Contract: Federal Energy Regulatory Commission, Form 542-PGA, "Purchased Gas Adjustment (PGA) Filing." •Contract Prices: Various natural gas industry newsletters. (See Appendix A.) •Residual Prices: Energy Information Administration, *Monthly Energy Review*, September 1988.

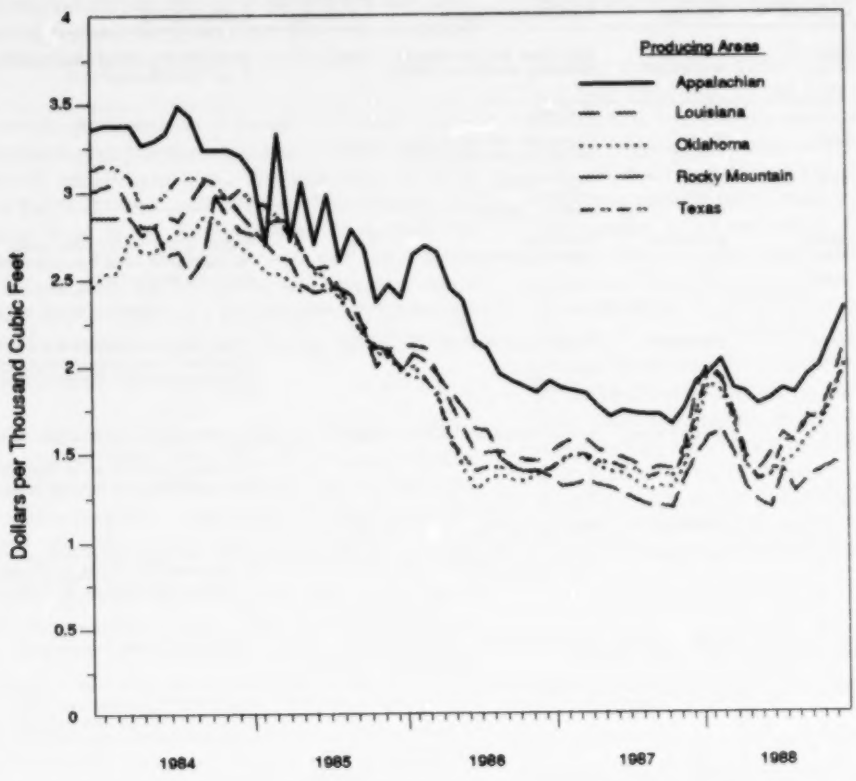
- Transportation fees for shipping nonsystem supplies through interstate pipelines have varied from year to year by no more than 10 cents per thousand cubic feet since 1982.

- The decline in prices of residual fuel oil, one of the primary fuels available as an alternative to natural gas in the industrial and electric utility sectors, has been dramatic, particularly since 1985. It should be noted that the natural gas prices in Table 15 measure average costs of supplies prior to delivery while the residual fuel oil price represents a cost of fuel delivered to the consumer. Nonetheless, comparisons of movements between the residual fuel price and the other series are meaningful.

These price trends have significant implications for the competitiveness of the system supply of interstate pipeline companies as a group as opposed to nonsystem supply and other fuels. The wider the price spread between system supply and alternatives to system supply, the greater the incentive for pipeline customers to seek price savings by going off-system--either by purchasing supplies directly from the producer and paying the pipelines to transport the gas, or by switching to the alternative fuel. Thus, the drop in oil prices combined with only gradual decreases in interstate pipeline company purchased gas costs encouraged the use of the alternative fuel oil. The adoption of transportation programs provided an incentive for customers to continue using natural gas. The prospect of losing system sales customers was less threatening to interstate pipeline companies than losing a gas consumer altogether. The loss of customers from the system entirely precludes the possibility of recovering even some portion of the fixed costs from revenues generated from their marginal consumers. Without the availability of transportation services to transport competitively priced spot-market gas, many more customers with the capability to do so would have switched to oil or another alternative fuel.

The overall trend appears to be toward a narrowing of the difference between the average system-supply price and the chief alternative to system supply (spot-market gas). If this trend is real, and continues, the expansion of the spot market should slow down as the relative price advantage of these supplies diminishes. For individual buyers, however, this trend will have little impact unless their pipeline suppliers: (1) mimic the overall trend toward lower system-supply price, (2) are in a position to be responsive to market conditions, and (3) offer flexible pricing policies.

Figure 9. Natural Gas Spot Price Trends For Major Producing Areas,1984-1988



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Natural Gas Division.

Competition from Alternative Fuels

Effective competition from alternative fuels generally is limited to markets where consumers have the capacity to switch easily between natural gas and one or more other fuels. Typically, these markets include a select group of large end users (electric utilities, industrial users, and, to some extent, large commercial customers).

An overview of the major types of end users of natural gas and their degree of marketing leverage (defined in terms of their ability to go off-system or switch to other fuels) is provided in Table 16. For customers that can burn alternative fuels, the delivered price of gas must not greatly exceed the Btu equivalence price of the alternative fuel. This disciplines both the wellhead price and transportation rates for gas.

As increasing numbers of customers go off-system to purchase supplies in the largely deregulated wellhead market, but continue to obtain transportation services from the regulated pipelines and local distribution companies (LDC's), the issue of how to apportion costs among customer classes becomes even more complex. Regulators allow transporters to recover their fixed costs plus a fair rate of return on their capital investments. How costs are apportioned determines the extent of differences in the rates charged to different classes of customers for different types of service (such as firm service to residential customers and interruptible service to industrial and electric utility customers with fuel-switching capability), and raises questions relating to the fairness of the methods applied.

Fixed costs for physical plant constitute the largest part of gas transmission and distribution system expenses. The allocation of these costs between volumetric charges (which are paid by

Table 16. End Users in the Natural Gas Marketplace

Customer	Supply Source	Type of Customer	Major Usage	Usage Characteristics	Marketing Leverage	Comments
Residential	LDC	Core	Heating, appliances	Firm sales, low volume per customer, weather sensitive	Low	State PUC's generally exert leverage on behalf of core market customers.
Commercial				Firm sales		
Small	LDC	Core	Space heating	Firm sales, low volume per customer, weather sensitive	Low	
Large	LDC, Pipeline, Marketer	Core	Space heating	Higher volume per customer, weather sensitive	Low	
		Usually Core	Boiler fuel	Some fuel switching possible	Low	Some larger users may enter interruptible contracts (with small firm commitments and fuel switching as a backup).
Industrial						
Small	LDC	Core	Feedstock	Critical for production	Low	Firms depending on natural gas as feedstock (an ingredient in product creation) are sensitive to price levels but must assure availability of natural gas.
		Core	Space heating	Usually firm sale	Low	Usually these users enter into lower cost interruptible contracts for brokered deals but generally back these up with other suppliers willing to issue such backup (at a price).
		Core	Boiler fuel	No fuel switching	Low	
Large	LDC, Pipeline, Marketer	Core/Noncore	Feedstock	Critical for production	Moderate	Large multi-plant users may generate pressure on suppliers by actual/suggested plant closings, production changes, etc. to achieve a lower cost level.
			Boiler fuel	No fuel switching	Low	Interruptible contracts are still often used.
				Can fuel switch	High	Large users may threaten to bypass the current supplier and/or use the possibility of an economic advantage through open-access and brokerage as leverage in lowering acquisition costs.
			Space heating	Usually firm	Moderate	
Electric Utilities	LDC, Pipeline, Marketer	Noncore	Boiler fuel	Almost always has fuel switching. High volume takes.	High	In some States environmental concerns negate the use of any peaking fuel other than natural gas. As a result, utilities are less likely to have fuel switching as a bargaining option.
			Peaking fuel	Cost sensitive, weather sensitive	High	

Source: Energy Information Administration, Office of Oil and Gas, Reserves and Natural Gas Division.

all customers) and demand charges (which are paid by firm customers but not by interruptible customers) determines the extent to which different classes of customers bear the system costs. Broadly speaking, the more fixed costs that are included in volumetric charges, the more interruptible customers share in paying pipeline costs. Including a larger share of fixed costs in demand charges, however, leads to firm customers bearing a larger share of system costs. The allocation of the fixed costs needs to consider the inherent tension between the competing interests of the firm and interruptible customers, in conjunction with the need to offer the interruptible customer an attractive rate to avoid the risk of the customer leaving the system altogether.

Competition Among Pipeline Companies

Competition among pipeline companies is generally less extensive than between gas and other fuels, given the limited number of markets (defined in terms of pipeline service areas) served by more than one pipeline with excess system capacity. The number of transportation options available in 1989 (at least during off-peak periods) is much greater than in the past, now that almost all major interstate pipelines are open-access transporters. As a result of the implementation

of open-access transportation: (1) A significant number of customers are now hooked up to more than one pipeline, and (2) Buyers who are only hooked up to one pipeline may have more than one option for getting the gas from a distant producer to the pipeline to which they are physically attached.

Although certain pipelines have in recent years faced severe competition from other pipeline companies, numerous buyers and sellers of natural gas (with the exception of large distributors and producers in certain parts of the country) still simply have little or no choice among companies for transportation services. Large-volume gas purchasers, however, do have many choices among suppliers from whom they purchase their natural gas. The choice is only limited by the number of participants in the spot market which, by most accounts, is still growing.

An overview of the major industry participants in the natural gas marketplace and the extent to which they compete with one another is provided in Table 17. Prior to the introduction of transportation programs, competition was limited by the structure and operating environment of the industry. While the number of gas producers and potential customers has always been large, many producers could sell to only one or a few pipeline companies and most customers could buy from only one or a few pipeline suppliers. The prevalence of long-term contracts impeded communication of market signals between consumers and producers, so prices responded slowly to changing conditions. Transportation programs guarantee a more competitive wellhead market for those customers able to purchase gas directly, provided open access to the transportation system is guaranteed in both the short and long term.

The introduction of competition into transportation services is much more difficult than the development of a competitive wellhead market. Pipeline and distribution systems are highly concentrated and capital-intensive, and require long lead times for new market entrants. This is the major difference between the transportation and the marketing of natural gas, given the relatively small capital costs associated with establishing a gas marketing service.

Many markets are served by at least two pipeline suppliers, which introduces some measure of competition into transportation services. The market can be made more competitive by allowing pipeline companies to open more sales taps to customers that have previously been served only by other pipelines. Pipelines in most regions, however, lack the excess capacity required to do so, since the goal of traditional regulation of the industry has been to constrain the addition of capacity deliberately to match projected future demand. As a result, companies in regions such as the Northeast (and perhaps in California) do not compete to any significant extent except during off-peak periods.

Pipeline companies retain significant advantages as gas suppliers compared to the new players in the interstate marketplace. For example, they have extensive experience in finding supplies and can assemble broad portfolios that distribute risks in obtaining supplies among a large number of sources and that allow them to collectively manage load requirements in an attempt to avoid coincident peaks in demand that exacerbate any potential problems in capacity allocation. The traditional market dominated by pipeline sales for resale is very unlikely to be reestablished. Pipelines can expect to face competition from large independent marketers, perhaps established by consortia of customers or producers. Pipelines also should expect to encounter greater competition from other purchasers, perhaps their own customers, in acquiring supplies in their traditional wellhead markets. Even if the pipeline companies were to regain a very large market share for system supply, they would continue to face potential competition that would apply a market discipline that never existed in the traditional market.

Competitive Elements in the Transportation Services Sector

Selective Discounting

Most of the major interstate pipeline companies have adopted transportation programs to supply spot-market gas. Although the rules of open-access transportation permit all customers ready access to this spot market, they also allow pipelines to practice selective discounting in establishing transportation rates. This means that in selling transportation services, the pipeline companies are allowed to discount their services provided they do not unduly discriminate among customers.

Under this practice, the Federal Energy Regulatory Commission (FERC) sets the maximum and minimum rates a pipeline is allowed to charge, and allows the pipeline to offer discounts from the maximum demand or volumetric charges at their discretion (the minimum rate allowed is the short-term marginal cost of moving gas). Selective discounting provides an effective means by which pipelines may meet competition from other pipelines or other fuels. Its success, however, depends on the exercise of market power to discriminate against core customers who do not receive the benefit of the rate discounts. Further, selective discounting is expected to

Table 17. Participants and Their Roles in the Natural Gas Marketplace

Participant	Role	Regulator	Competition	Comments
Producer	Seller/Producer	FERC (Sets maximum price levels on some still-controlled gas).	Other producers	Producers in the past had limited downstream markets because pipelines generally bought the gas for their own brokerage. With open access increasing, producers may now also develop markets and expand their potential base of LDC, industrial, and electric utility customers.
Interstate Pipeline	Transporter	FERC	Other pipelines	Transport may be under NGA Section 7(c), NGPA Section 311, or Order 500 blanket certification.
	Reseller (Brokering)	FERC	Interstate pipelines, Marketers	As a reseller the pipeline buys for its own position and sells gas pursuant to tariff conditions and price levels filed with FERC.
	Local Distribution Company	State PUC	Conservation, fuel efficiency, technology	Sales are primarily to residential and commercial customers.
	Main Line Industrial Supplier	FERC certificate /State PUC tariffs	LDC's, other pipelines, Open-access, Alternative fuels	Proximity to the delivery points of alternate suppliers dictates the degree to which competition is effective.
	Electric Utility Sales	FERC certificate /State PUC tariffs	Alternative fuels, Other pipelines, Marketers	Environmental issues may have an impact on the degree of competition from alternative fuels.
	Storage Operator	FERC/State	None	
Intrastate Pipeline	Transporter	State PUC	Other pipelines, LDC's, Bypass	Some FERC regulations govern the relationship between intrastate and interstate pipeline companies.
	Reseller (Brokering)	State PUC	Other pipelines, Marketers	
	Local Distribution Company	State PUC	Conservation, fuel efficiency, technology	
	Main Line Industrial Supplier	State PUC	Alternative fuels, Marketers, LDC's	
	Electric Utility Sales	State PUC	Alternative fuels, Marketers	
	Storage Operator	State PUC	None usually	
Local Distribution Company (LDC)	Local Distribution	State PUC tariffs	None	
	Residential	State PUC tariffs	None	Usually sales under firm commitments.
	Commercial	State PUC tariffs	None	Larger users, however, may be able to switch fuels.
	Industrial	State PUC tariffs	Fuel switching	Mainly interruptible sales.
	Electric Utilities	State PUC tariffs	Bypass/marketers	
	Transporter	State PUC	Pipelines	Some FERC regulations affect the way LDC's may interact with interstate pipeline companies.
	Reseller	State PUC	None	
	Storage Operator	State PUC	None	
Marketer/ Broker/ Agent	Buyer	None	Pipelines, LDC's	A marketer may be a pipeline affiliate, an LDC affiliate, a producer affiliate, or an independent.
	Broker	None	Their potential clientele	
	Transport Arranger	None	Pipelines, LDC's	Marketers usually do not buy for their own position but will normally have aggregations of gas available to downstream customers for brokerage. Or they may confine their services to bringing the parties together, providing contractual advice, arranging transportation, and closing the deal.
	Capacity Buyer	FERC	Other marketers, on-system firm customers	Notice of Proposed Rulemaking May 1988, Docket RM88-13, called for certification and permitted brokering or leasing of firm capacity on interstate pipelines by marketers and others.

Source: Energy Information Administration, Office of Oil and Gas, Reserves and Natural Gas Division.

arise only in markets that have several suppliers or available alternative fuels. Pipelines have few incentives to offer selective discounts to any customers unless the customers threaten to switch to another pipeline or another fuel.

Selective discounting is defended on the grounds that the revenues contributed by those to whom the discounts are offered will also benefit core customers. This argument depends on the assumption that any rates under selective discounting would cover at least the variable costs of supplying those customers. Revenues received in excess of the variable costs would offset some portion of fixed costs, thus benefitting the core customers.

Bypass

Another way pipelines are able to compete is to bypass the local distribution company (LDC) in order to deliver gas directly to customers at a lower price than the customer would obtain from LDC system supply. The location of the customer relative to the pipeline route frequently determines whether or not this is a viable option for a particular customer. Physical barriers to competition in the delivery of the gas, however, do not preclude LDC's from becoming open-access transporters to give all their customers access to competitive wellhead markets.

The degree to which pipelines are allowed to bypass LDC's and deliver gas directly to end users is an issue that the FERC has not addressed because direct sales and deliveries of gas to end users are under the jurisdiction of the consuming States.

Capacity Brokering

A major barrier to a fully competitive transportation services sector is the limited number of transporters serving particular service areas. As already discussed, pipeline-to-pipeline competition is limited by the physical structure of transportation systems. FERC has proposed a strategy for distributing rights to firm transportation service among a greater number of market players to make transportation services more competitive.

An April 1988 Notice of Proposed Rulemaking would allow open-access pipelines to establish what FERC calls capacity brokering programs. Such a program would make the rights of pipeline customers to firm transportation on the pipeline system marketable. This means that customers would be able to resell their rights to brokers or to other customers at a market-determined price. By distributing transportation rights in this way, a capacity brokering program could potentially circumvent the strong market position of the pipeline company, particularly in highly concentrated market areas.

As of April 1989, an experimental capacity brokering program has been proposed by United Gas Pipeline Company, but has not yet been accepted by the FERC.

Capacity brokering appears to offer, in theory, a reasonable approach for overcoming structural barriers to competition. In practice, the effectiveness of the program is likely to hinge on the extent to which difficulties in its implementation are overcome. For example, the program will need to define appropriate markets to measure market concentration. A more difficult challenge is the question of how to treat markets in which a small number of customers control the rights to firm transportation in the market--for example, in California, where two LDC's already control all of the interstate pipeline capacity serving the State. FERC proposes, as a precaution, to test individual markets for competitiveness and impose price caps on the sale of firm service rights where excessive market concentration is evident.

Innovations in Ratemaking

Ratemaking, according to the traditional regulatory philosophy, should be designed to accomplish three separate goals: ration capacity, maximize throughput, and recover costs. Reconciling these three goals presents a major challenge to regulators of today's natural gas industry. The main difficulty is that the market-based rates developed to ration capacity and maximize throughput may or may not allow a company to fully recover its costs. While some companies may earn a rate of return in excess of what would traditionally be considered a fair rate of return, others may earn less, or perhaps not completely recover costs.

FERC is limited in the extent to which it may adopt new methods of ratemaking to deal with the inherent difficulties in reconciling ratemaking goals. Since current ratemaking approaches differ from company to company, FERC must justify any new ratemaking approaches on a case-by-case basis, even though changes introduced through its rulemaking proceedings generally apply to all companies. Furthermore, as a regulatory body, FERC has an institutional commitment to protect core customers from the full effects of the operation of a free market. This is particularly important in uncompetitive markets, where customers are most vulnerable to the potential market power of utilities.

Given these constraints, FERC realistically can only make incremental adjustments to tariff structures, and is limited in practice in the extent to which costs may be shifted toward the demand charge. Even incremental changes may be difficult to implement if they are perceived as not being in the interests of the pipeline companies.

The Gas Inventory Charge (GIC) is a good example of how FERC introduces ratemaking innovations given these constraints. FERC Order 500 authorized the use of this new type of charge, but leaves the design of the GIC to the individual pipelines. Thus, GIC's will vary among pipelines, and some pipelines may not use them at all. The underlying purpose of the GIC's is to assess what amounts to an insurance charge for maintaining a pipeline company's system supply. Customers converting some or all of their pipeline purchases from system supply to transportation services generally continue to view the pipeline company's system supply as a backup source of gas in case of difficulties in obtaining nonsystem supply.

Conclusion

The new transportation market for customer-owned natural gas that was documented in this report is an evolving one. Its future direction depends in large part on how issues raised by the unbundling of traditional pipeline services and the adoption of more market-oriented approaches to the regulation of these services are resolved. These new markets raise fundamental issues whose resolution will deeply affect the evolution of the natural gas markets:

- Traditional ratemaking may conflict with attempts to introduce market forces to many parts of the industry. Traditional ratemaking was based on a cost-of-service philosophy that allowed utilities to recover costs and was not necessarily concerned with the customers' valuation of the service or product.

- The apportionment of costs among customer classes has always been a serious point of contention. The proper resolution of the problems inherent in the process has become even more difficult with the conversion of the role of pipelines to providing unbundled transportation services. Correct pricing of each service to achieve market efficiency depends upon avoiding distortions caused by the misallocation of costs.

- Competition should be maintained where it already exists (for example, increasing competition has been widely recognized as a result of deregulation of wellhead markets). Transportation services need to be structured in such a way as to continue to guarantee the proper functioning of a competitive wellhead market. Current approaches (such as open access) may not be appropriate, necessitating other regulatory innovations.

- The introduction of more competition into transportation markets raises considerable difficulties. The current approach of selective discounting may be rejected, like the Special Marketing Programs before it, by the courts as unduly discriminatory. Regarding barriers to entry, new elements of competition need to be introduced into transportation services where possible. Capacity brokering in itself may prove to be inadequate or inappropriate.

The most appropriate policy at the Federal level is unclear, at best, given the complex issues outlined above. Although a full analysis of these types of issues remains beyond the scope of this study, how they are resolved will have long-term implications for the future operation of natural gas markets.

Appendix

Data Sources and Processing Notes

Appendix

Data Sources and Processing Notes

Introduction

This appendix provides the reader with information on the data sources used in developing the substance of this report as well as the supporting tables and graphs. In addition, it includes background on the various methodologies employed in creating the data base from which the statistics were compiled and pertinent comments and additional notes regarding the characteristics of the data that were either too long or inappropriate to include as footnotes or explanatory comments in the main text.

Supporting data used in this report were collected from several sources. The principal source was the Federal Energy Regulatory Commission (FERC) Form 2, "Annual Report of Major Natural Gas Companies." Other sources included the FERC Form 11, "Natural Gas Pipeline Company Monthly Statement," and various issues of the Energy Information Administration publications, *Natural Gas Monthly* and *Natural Gas Annual*.

Also used in compiling research and background materials concerning the recent history of the industry, as well as corporate and regulatory events, were several natural gas industry periodicals. Principal among these were: *Foster Natural Gas Report*, *Inside FERC*, *Gas Daily*, *Natural Gas Intelligence Newsletter* and *Inside Energy*. Among the information gleaned from these sources were various surveys of "Spot" and "Long-Term Contract" market prices from which a time series of these prices were developed and used in Chapter 4 of the report.

FERC Form 2

FERC Form 2, "Annual Report of Major Natural Gas Companies," collects data from approximately 44 interstate pipeline companies. A major company is defined as one whose combined sales for resale and gas transported or stored for a fee exceeded 50 billion cubic feet (measured at 14.73 psi and 60 degrees Fahrenheit) in each of the 3 previous calendar years. Companies that fall below the Form 2 reporting threshold are required to file only a FERC Form 2A report. The FERC Form 2A report is a less detailed report of a company's annual operations.

In 1987 there were 134 interstate natural gas pipeline companies, of which 43 filed FERC Form 2. Detailed information from the FERC Form 2 for these major pipeline companies is published in the Energy Information Administration annual report, *Statistics of Interstate Natural Gas Pipeline Companies* (DOE/EIA-0145).

The portions of the FERC Form 2 used in the development of the computer data base underlying the examination of the trends in interstate natural gas transmission consists of those schedules pertaining to:

- Field and Main Line Industrial Sales of Natural Gas
- Sales for Resale - Natural Gas (Account 483)
- Revenue from Transportation of Gas of Others - Natural Gas (Account 489).

Data from these schedules for 1978 through 1987 are contained on the data base, but due to variations in reporting requirements over the years, data coverage of the complete period was not available for all pipeline companies.

Field and Main Line Sales

Field and main line sales by interstate natural gas pipeline companies refer to natural gas sold to industrial customers or public authorities directly from the companies' field or transmission lines. These sales do not include sales made by intrastate pipelines or distribution companies that are operated by the reporting pipeline company. About 22 companies reported field and main line sales in 1987.

Most of the regulatory authority and controls generally exercised over natural gas pipelines do not extend to field

and main line sales. The price for main line sales is negotiated between buyer and seller and is not subject to direct regulation by the FERC. The pipeline company, however, must show FERC that the sale is in the public interest, that is, that the negotiated price and the sale are not detrimental to service to existing customers, before FERC will grant authorization for the sale. In certain instances, State utility commissions exercise regulatory authority over field and main line sales of interstate pipeline companies.

The reporting of "Field and Main Line" in FERC Form 2 is requested on a customer/delivery-point level. However, because the Form 2 remains primarily a reporting vehicle and not a highly structured data collection instrument, the actual format and level of reporting differs from respondent to respondent. In general, the transactions reported contain at least the following items of information:

- Customer name and affiliation with the reporting pipeline
- State and city/town/county of delivery
- FERC Docket under which the sales were authorized
- The type of delivery--firm, off-peak, interruptible
- The average Btu content of the gas delivered
- The volume of gas sold during the year
- The revenue collected on the gas sold
- Average price per thousand cubic feet
- Coincidental and noncoincidental peak days
- Volumes delivered on coincidental and non-coincidental peak days.

Sales for Resale Transactions

Sales for resale represent deliveries to other interstate pipelines and other gas utilities (local distribution and intrastate pipeline companies) that are to be resold. FERC approval and the granting of a "Certificate of Public Convenience and Necessity" must precede the commencement of gas deliveries under a sale for resale contract, and thereafter, the contract cannot be abandoned (terminated) by either party without FERC approval. In addition, the tariff/rate schedule covering the terms and conditions concerning the sales must be on file with FERC. Through these mechanisms, FERC maintains oversight and control over the utilization of pipeline capacity and the nondiscriminatory allocation of pipeline sales.

The reporting of "Sales for Resale" in the FERC Form 2 is requested on a customer/delivery-point level. However, as noted above, the level and completeness of data reported is respondent dependent. Nevertheless, the transactions reported generally contain at least the following items of information:

- Customer name and affiliation with the reporting pipeline
- State and city/town/county of delivery
- FERC Tariff Rate Schedule covering the sales
- The volume of gas sold during the year
- The revenue collected on the gas sold
- Average price per thousand cubic feet
- Coincidental and noncoincidental peak days
- Volumes delivered on coincidental and non-coincidental peak day.

Revenues From Transportation of Gas for Others

These transactions represent the reporting of gas transported or compressed by the pipeline on behalf of others during the report year. Transportation activities on behalf of others must be approved by FERC prior to commencement and, depending upon the type of customer, may be restricted to a specific time frame or delivery level, and subject to certain filing/reporting requirements. Gas transportation programs permitted by FERC range from the tightly defined and restrictive (under NGA Section 7(c)), to blanket certificate coverage (under Order 500 open-access programs).

Transportation transactions reported in the FERC Form 2 normally include gas transported under all types of

transportation agreements (short-term, long-term, firm, interruptible, Section 311, Section 7(c), etc.). Unfortunately, the specific program type is rarely identified. Also, if the customer is covered under more than one type of agreement, the delivery level of each usually is not provided.

A typical transaction reported on the FERC Form 2 "Revenue from Transportation of Gas of Others" schedule contains the following items of information:

- Customer name and affiliation with the reporting pipeline.
- Receipt location and delivery point location.
- Miles gas transported - Receipt to Delivery point
- The volume of gas received during the year
- The volume of gas delivered during the year
- The revenue collected on the gas sold
- Average price per thousand cubic feet delivered
- FERC Tariff Rate Schedule covering the agreement if applicable.

Notes on Form 2 Data Utilization

Because the reporting of the "Field and Main Line Sales," "Sales for Resale" and "Transportation of Gas for Others" on the Form 2 is not highly structured and formatted, it becomes necessary to incorporate various data handling procedures in the building of the data base and in the use of the data in tables and graphs. The following section is intended to point out these aspects of the data that should be considered by anyone subsequently citing or using the data contained in the report for other purposes.

Customer Types

A significant area of study presented in this report is of changes in natural gas delivery patterns for the major customer types serviced by the interstate pipeline system. These customer or client categories may be labeled as interstate pipeline, intrastate pipeline, local distribution company, producer, end user, marketer or others. Since the reporting pipeline did not always classify the customer, a customer classification method was devised and implemented for the data base. The scheme used was as follows:

- If a customer classification was provided by the data originator, then it was retained.
- Once the building of the data base was complete, an alphabetical file of customers and their classifications was created.
- Those customers that had not been assigned a category were researched using the Form EIA-176 Survey Frame profile data as an authority. If the customer appeared in this survey list, the type of company was extracted from the Form EIA-176. Questions involving the assignment of intrastate and interstate pipelines as well as local distribution companies and gas plant operators usually were resolvable using this survey frame list.
- If a customer category was still not assignable then various industrial sources were researched.
- Upon completion of the research phase the data base was updated.

Any remaining unresolved assignments in the "Main Line" data were defaulted to the category of end user since direct sales implied ultimate consumer. Remaining "Sales for Resale" data were defaulted to local distribution company since most resales are made through this category of company. Unassigned "Transportation" clients were checked to see if they also appeared in one of the other two sets of data. If found, then that assigned classification was used. If not, then the client was placed in the "Other" category.

Location of Receipt and Delivery of Transportation Volumes

In many entries, the State in which the gas was received, or to which it was transported, was not provided by the respondent. Indeed, when such data were present, it was not always definitive. For example, a transaction description may merely relate that the "volumes were received in various counties in Utah and Wyoming and delivered to points in the States of Iowa and Nebraska." In these instances, the multiple States notation was retained

but a separate data item was created in which the delivery point was assigned one of the points cited. Because of this situation the "State delivered" is of limited usefulness. However, since the primary focus of the study is at the regional level, and as long as the several States cited in the transaction are within the same region, the choice of either State is reasonable.

Where no delivery location was provided, the pipeline data reports for "Main Line" and "Resale" were examined to determine if the customer previously received sales deliveries. If it were obvious that the transportation service was a successor to a single point sales contract, then the assumption was made that the transportation delivery was made to the same site and therefore in the same State.

Assignment of Geographic Regions

A regional designation, based on delivery point, was assigned to each transaction in the data base. If no State was present, a region was assigned based on the major service area of the pipeline or on an evaluation of a likely customer receipt point. Regional groupings were based U.S. Bureau of Census definitions (see below).

Exclusion of Certain Delivery Volumes from Aggregation

Exchange and Compression Gas

In their reporting of "Transportation of Gas for Others," respondents are requested to include volumes "Compressed" for others. In addition, some pipelines include "Exchange" gas volumes in their reporting. Compression of gas is a service performed and is not truly transportation program gas. Exchange gas volumes are balancing transactions between pipelines that reflect logistical efficiencies rather than actual movement of transportation program gas.

While these transactions are included in the data base in order to retain the integrity of the reported submission, these volumes are not included in any of the aggregations and summaries reported in the main text that present FERC Form 2 data. Inclusion of these volumes would distort the true level of transportation program gas overall and for specific companies reporting these types of transactions.

Adjustments and Carryovers

Since the principal purpose of the FERC Form 2 is the reporting of financial and operational data and the balancing of all accounts, the transactions reported in the three subject areas necessarily include offsetting and balance adjusting transactions. Such items as refunds, credits and debits applied to subaccounts, and balances carried forward from one period to the next, are part of the reported data.

To maintain completeness of the data submission and audit control, these transactions were retained in the data base. However, they are not included in any of the summaries exhibited in the main text.

As a result of the above exclusions, any pipeline total deliveries, or aggregation across categories, will not necessarily agree with volumes reported in other publications that reflect the account balances for the annual period.

FERC Form 11

Also used in this study were data collected on the FERC Form 11, "Natural Gas Pipeline Company Monthly Statement," which solicits monthly information from major interstate pipeline companies about natural gas purchases, sales, and expenses. FERC Form 11 collects monthly information about natural gas purchases, sales, and expenses from major interstate pipeline companies. It was designed as an instrument to allow FERC to fulfill its monitoring and regulatory responsibilities in a timely manner.

FERC Form 11 is filed by major interstate natural gas pipeline companies with 50 billion cubic feet (Bcf) of combined gas sales for resale, gas transported interstate, and gas stored for a fee in the previous calendar year. Although the number of companies qualifying varies slightly from year to year, the number of companies currently (1988) is 46.

The FERC Form 11 is a company level summary report of financial and volumetric data for the report month. Unlike the FERC Form 2, the sales and transportation data are not available at any level of detail such as State or customer level. The Form 11 does provide data on a monthly basis and is more current than that of the Form 2. This aspect of

the Form 11 data permitted an extended examination of overall average price and sales levels beyond the 1987 calendar year available in the FERC Form 2 data.

While the FERC Form 11 collects a large number of data elements, only a limited number were utilized in the report. These included volumetric and revenue (cost) data for the following:

- Wellhead Purchases from producers
- Import Purchases
- Purchases from major pipeline companies
- Purchases from other pipeline companies
- Gas transported for others (where revenues equal the fee received)
- Sales for Resale
- Direct Industrial Sales.

The FERC Form 11 data base used for this report contained approximately 289,000 data records covering the period from January 1979 through September 1988; about 47,000 of these records, specifically concerning natural gas purchase and sales data, were used in compiling data cited in the report.

All data items requested on the FERC Form 11 on a monthly basis are also included on an annual basis on the FERC Form 2. Over the years, the annual summation of FERC Form 11 data corresponds quite precisely with that submitted on the FERC Form 2. Both sets of data are relied upon extensively by EIA and FERC in compiling reports of general interest to the public.

Further details concerning the FERC Form 11, its history and EIA processing methodology, may be found in the appendices of any issue of the EIA periodical *Natural Gas Monthly* (DOE/EIA-0130).

Spot Price Survey Data

The "Spot" and "Long-term" contract price data referred to in Chapter 4 of the report were compiled from raw data resident on an EIA "working data base" that was put together from "survey" data reported in natural gas industry trade periodicals. These data for the most part were price quotations solicited from industry contacts and marketing firms by the editors of these reports and are not offered as a thorough and scientific survey of the market at press time. The price quotations that are provided are not accompanied by representative volumes.

Nevertheless, since no formal data collection survey of "Spot" and new "Long-Term" contracts with regard to natural gas exists, these data provide at least some insights into an admittedly uncharted area. Approximately 18,000 observations, covering 4 calendar years of reports, are represented on the data base.

Price Data Adjustments

Price data presented in Table 13 were adjusted for inflation based on the following annual GNP inflator values (extracted from the EIA's *Annual Energy Outlook*): 1982 = 1.229; 1983 = 1.182; 1984 = 1.138; 1985 = 1.104; 1986 = 1.077; 1987 = 1.045; 1988 = 1.00.

Regional Transportation Data

The regional aggregations of transportation program deliveries to industrial and electric utilities examined in this study were extracted from the EIA publication *Natural Gas Annual*.

These data were originally collected by the EIA on the Form EIA-176, "Annual Report of Natural and Supplemental Gas Supply and Disposition." They were processed into a large computer data base, then compiled, tabulated, and subsequently exhibited in the annual report on a State and regional basis. The respondent universe of the Form EIA-176 includes interstate and intrastate pipelines, investor and municipally owned natural gas distributors, underground natural gas storage operators, synthetic natural gas plant operators, and field, well, or processing plant operators that deliver natural gas directly to consumers and/or transport gas to, across, or from a State border through field or gathering lines.

Further details concerning the EIA-176, its background and EIA processing methodology, may be found in the appendices of the EIA report *Natural Gas Annual 1987* (DOE/EIA-0131).

The specific data extracted from the *Natural Gas Annual* and examined in this study include State level annual deliveries to industrial users and electric utilities; deliveries for the account of industrial users and electric utilities; and deliveries to all consumers. These data were placed in a PC spreadsheet file and further refined to permit the analysis presented in Chapter 2 of the report.

U.S. Regional Definitions

The Regional breakouts used in this report correspond to the Census Division classifications, as established by the Bureau of the Census, U.S. Department of Commerce. These groupings are as follows:

New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

Middle Atlantic: New Jersey, New York, and Pennsylvania

East North Central: Illinois, Indiana, Michigan, Ohio, and Wisconsin

West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota

South Atlantic: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia

East South Central: Alabama, Kentucky, Mississippi, and Tennessee

West South Central: Arkansas, Louisiana, Oklahoma, and Texas

Mountain: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming

Pacific: California, Oregon, and Washington.

Major Pipelines Included in Report

Table A1 lists the pipeline companies examined in this report. The 20 major companies selected for inclusion accounted for between 86 and 88 percent of all interstate sales and transportation reported on FERC Form 2 for each year from 1982 through 1987. The additional 11 interstate pipelines were selected primarily because they were mainly transporters.

Table A1. Major Interstate Pipeline Companies

Major Pipelines or Systems

Coastal System
- ANR Pipeline Company [c]
- Colorado Interstate Gas Company

Columbia Gas System
- Columbia Gas Transmission Corporation
- Columbia Gulf Transmission

CNG Transmission Corporation

El Paso Natural Gas Company

KN Energy Incorporated

Natural Gas Pipeline of America

Enron System
- Northern Natural Gas Company
- Florida Gas Transmission Company [a]
- Transwestern Pipeline Company

Panhandle Eastern System
- Panhandle Eastern Pipeline Company
- Trunkline Gas Company

Southern Natural Gas Company (Sonat Incorporated)

Tenneco System
- Tennessee Gas Pipeline Company

Texas Eastern Transmission Corporation

Texas Gas Transmission Corporation (CSX Corporation)

Transcontinental Gas Pipeline Corporation (Transco Incorporated)

United Gas Pipeline Company (LaSalle Energy Corporation)

Williams System
- Williams Natural Gas Company
- Northwest Pipeline Corporation

Gulf Offshore Partnerships

High Island Offshore System [b]

Sea Robin Pipeline Company [e]

Stingray Pipeline Company [d]

U-T Offshore System [e]

Canadian/Rocky Mountain Gas Transporters

Great Lakes Transmission Company [f]

Northern Border Pipeline Company

Northwest Alaskan Pipeline Company [g]

Overthrust Pipeline Company [h]

Pacific Gas Transmission Company [i]

Trailblazer Pipeline Company [j]

Wyoming Interstate Co Ltd [k]

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[a] Jointly owned by Enron Corporation and Sonat Incorporated.
[b] Partners are: ANR Pipeline Company (Coastal), Natural Gas Pipeline of America, Texas Gas Transmission Company, United Gas Pipeline Company and Transcontinental Gas Pipeline Corporation.
[c] Jointly owned by Sonat Incorporated and United Energy Corporation.
[d] Partners are: Natural Gas Pipeline of America and Trunkline Gas Company.
[e] Partners are: Natural Gas Pipeline of America, Texas Gas Transmission Company, United Gas Pipeline Company and Transcontinental Gas Pipeline Corporation.
[f] Partners are: Colorado Interstate Gas Company (50%) and TransCanada Pipeline Company (50%)..
[g] Wholly owned by Northwest Pipeline Company (Williams System).
[h] Partners are: Colorado Interstate Gas Company (CIG Overthrust), Columbia Gas Transmission Corporation (Columbia Gulf Transmission Company), Questar Pipeline Company, Natural Gas Pipeline of America (NGPL Overthrust Company), Enron Corporation (Northern Natural Gas Division), and Tennessee Gas Transmission Company (Tennessee Overthrust Gas Company)..
[i] Wholly owned by Pacific Gas and Electric Company.
[j] Partners are: Columbia Gas Transmission Corporation (Columbia Gulf Transmission Company), Natural Gas Pipeline of America (NGPL Trailblazer Incorporated), and Enron Corporation (Enron Trailblazer Company).
[k] Wholly owned by Colorado Interstate Gas Company.
Source: Federal Energy Regulatory Commission (FERC).

Glossary

Affiliated Company: A company that is either directly or indirectly controlled and/or owned by another firm or holding company.

Alternative Fuel Capacity: The on-site availability of apparatus to burn fuels other than natural gas.

Base Price: The stated value of natural gas (usually at the wellhead) before any imposition of taxes, gathering, compression, or other charges.

Best Efforts: A contractual agreement in which the seller (or transporter) agrees only to supply or deliver natural gas on an "as available" basis and is not to be held responsible for any disruption in service regardless of the circumstances. Also see Interruptible Gas.

Blanket Certificate (Authority): Permission granted by the Federal Energy Regulatory Commission (FERC) for a recipient to engage in an activity (such as transportation service or sales) on behalf of a general class of customers and at negotiated throughput levels, without case-by-case approval from the FERC.

Btu: Abbreviation for British Thermal Unit. The quantity of heat necessary to raise the temperature of 1 pound of water 1 degree Fahrenheit at a specified temperature and pressure (from 59 degrees Fahrenheit to 60 degrees Fahrenheit at an atmospheric pressure of 29.92 inches of mercury.)

Burner-Tip: The generic term commonly used to indicate the ultimate point of consumption for natural gas. By definition, it also includes its consumption as a feedstock (an ingredient in products manufactured), and its use in pipeline operations and other overhead activities.

Buyer Protection Clause: Any contract provision that permits the buyer to reduce the price below the current or redetermined price. One of the most common provisions allows the pipeline company to request a redetermination if the price paid by the pipeline is disallowed by the Federal Energy Regulatory Commission (FERC) in ratemaking decisions. Normally, the price will then fall to a level the pipeline is allowed to recover. Other escape clauses, called market-out clauses, deal with the marketability of the gas or the economic conditions regarding sale of gas in certain locations. (See Market-Out Clause).

Bypass: The construction of a physical connection between a large end user and a supplier, other than the historic or common suppliers, when the economics dictate; that is, the system supply price of the common supplier is higher than the total price of off-system supplies available through the market and separate transport of the purchase via the alternative (Bypass) delivery point. The term is sometimes applied when an end user bypasses its historic supplier by closing down production or moving production to a lower cost gas area.

Captive or Core Customer: A natural gas user who cannot readily leave or switch a system supplier due to physical or economic factors, availability of alternative fuels, or lack of fuel-switching capability. Usually applicable to residential and small commercial users, but can (under certain conditions of alternative fuel availability) be applied to large industrial and electric utility users as well.

Carriage: The transportation of natural gas by a pipeline as a separate service for a fee, as opposed to the transportation (movement) of natural gas in which the pipeline has an equity position (owns the gas transported).

Casinghead Gas: Associated and dissolved gas produced along with crude oil from oil well completion. (Also called oil well gas.)

Ceiling Price: See Price Ceiling.

Class Rate Schedule: A rate schedule that is applicable to one relatively limited and specific class of business or customer use.

Commodity Charge: That portion of the charge or rate based upon the volume of gas delivered.

Commodity Cost: Those costs deemed proper to be allocated on the basis of use of gas.

Commodity Rate: Rate per thousand cubic feet (Mcf, or therm) to be charged for the number of units delivered.

Contract Conversion: Under Federal Energy Regulatory Commission (FERC) Order 500, pipeline sales customers have the option of converting their purchase volumes to open-access transportation services over a 5-year term. The

conversion level is contractually negotiated but, in general, the process calls for a 25 percent conversion in the first year, 20 percent conversion in the second year, and so on, until the negotiated conversion level is reached.

Contract Demand: Service contract that provides a distributor (buyer) with a specific volume of gas that typically is larger than the amount specified in general service contracts. The gas charge is usually based on a demand charge and on a commodity charge. In addition, the minimum bill for this type of contract often is equal to the demand charge plus a percentage of the contract volume.

Contract Term: Term of current contract. This is only an indicator of the relative length of the contract. Unless a specific date is provided in the contract, this will not provide an accurate expiration date for the following reasons: (1) the term often starts from the date of initial deliveries (this is not available from the contract); (2) some contracts may be extended from month to month or year to year until cancelled; and (3) some contracts are based on the life of the lease or remain in effect until reserves are depleted.

Cost Allocation: Term used to signify a procedure in which common or joint costs are apportioned among customers or classes of customers.

Cost of Capital: Determined by weighing the individual costs of the various classes of capital. Costs of long-term debt would include interest expense, premiums and debt discount and expense. Preferred stock costs include dividends, together with flotation costs and any premium or discount. The "bare-bones cost" of common stock is usually determined from a study of earnings-price ratios for a number of years of the particular stock and other flotation costs. Additionally, other factors such as risk, financial stability, and ability to attract new common equity may be considered at this juncture or "added on" at the end to arrive at a just and reasonable rate of return.

Cost of Service: A ratemaking concept used for the design and development of rate schedules to ensure that the filed rate schedules recover only the cost of providing the gas or electric service at issue. This concept attempts to correlate the utility's costs and revenues with the service provided to each of the various customer classes.

Cost of Service Tariff: A type of tariff which specifies that a natural gas company (seller) shall be reimbursed for his cost of service, including a specified rate of return on the rate base, as distinguished from the usual tariff which specifies a rate per billing unit of contract demand or per unit of sales volume or both.

Curtailment: Reduction of deliveries of natural gas.

Definite Price Escalator Clause: Contract provision that provides for either a fixed dollar price increase or a set percentage price increase on a periodic basis.

Demand Charge: That portion of the charge or rate for gas service based upon the customer's demand characteristics.

Demand Costs: Those costs included in the total cost of service which are deemed proper to be allocated to classes of customers on the basis of use of gas during a peak period.

Demand Rate: The rate (per day, per month, or per year) to be charged for each unit of capacity (contract demand) assigned to the customer.

Deregulation Clause: A clause in contracts currently governed by regulatory price ceilings to provide a process to reset the price of gas should price controls and regulatory authority cease.

Development Well: A well drilled within the proved area of an oil or gas reservoir to the depth of a stratigraphic horizon known to be productive.

Discount Sale Program: Special Federal Energy Regulatory Commission (FERC) approved programs allowing, on a case-by-case basis, the discounting of system-supply volumes to large end users when it has been shown that without discounting the customer would leave the system.

Emergency Service: Service contract for the purchase of gas for resale that is available to a distributor (buyer) on an ad-hoc basis when a crisis exists which threatens the supply of its customers. Service under this schedule can be curtailed or interrupted at the discretion of the natural gas company (seller).

Escalator Clause: A clause in a purchase or sale contract that permits, under specified conditions, adjustment of price.

Favored Nations Clause: (See Most-Favored-Nation Clause.)

Federal Energy Regulatory Commission (FERC): The Federal agency with jurisdiction over natural gas pricing,

wholesale electric rates, hydroelectric licensing, oil pipeline rates, and gas pipeline certification.

Firm Customers: Customers for whom contract demand is reserved and to whom the natural gas company is obligated to furnish service.

Firm Service: Service offered to customers (regardless of class of service) under schedules or contracts which anticipate no interruptions. The period of service may be for only a specified part of the year as in off-peak service. Certain firm service contracts may contain clauses that permit unexpected interruption in case the supply to residential customers is threatened during an emergency.

First Sale of Natural Gas: Any sale, exchange, or transfer for value of any volume of natural gas:

- To any interstate or intrastate pipeline, local distribution company, or to any person for use by such person
- Any sale that precedes any sale described above
- Any sale that precedes or follows any sale described above (in the first two bullets) and is defined by the Federal Energy Regulatory Commission (FERC) as a first sale in order to prevent circumvention of any maximum lawful price established under the Natural Gas Policy Act (NGPA).

Excludes the sale of any volume of natural gas by any interstate pipeline, intrastate pipeline, or local distribution company, or any affiliate thereof, unless such sale is attributable to volumes of natural gas produced by such interstate pipeline, intrastate pipeline, or local distribution company, or any affiliate thereof.

Fixed Costs: All costs included in the cost of service (which generally are proportional to the size of plant or size of investment in rate base) which do not tend to fluctuate with the volume of gas passing through the system.

Fuel-Switching Capability: The ability of an end user to change readily the type of fuel consumed whenever a price or supply advantage develops for an alternative fuel.

Gas Well Gas: Natural gas produced from gas well completions, as opposed to oil well gas.

General Service: Service contract which contains a specific contract quantity (generally greater than 5,000-7,000 Mcf/day) that is obligated to a distributor (buyer). The gas charge is usually based on a demand charge and on a commodity charge. The minimum bill, however, is generally equal to the demand charge.

High-Cost Gas: (See NGPA Gas Categories.)

Indefinite Price Escalators: Provisions that allow for future price increases that cannot be determined at the present time.

Interruptible Customers: An interruptible customer may purchase gas at those times in which firm customers' requirements do not use up the system's capacity. To compensate for the interruptible nature of this service, the interruptible customer usually pays only a commodity charge. The advantage of interruptible customers accrues to a pipeline through improvement of its load factor by taking up capacity unused by firm customers.

Interruptible Gas: Gas made available under agreements which permit curtailment or cessation of delivery by the supplier.

Interstate Market: Wellhead sales of natural gas to a pipeline subject to Federal controls under the Natural Gas Act.

Interstate Pipeline: A natural gas pipeline company that is engaged in the transportation, by pipeline, of natural gas across State boundaries, and is subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) under the Natural Gas Act.

Intrastate Market: Wellhead sales of natural gas to a purchaser that is not an interstate pipeline.

Intrastate Pipeline: A natural gas pipeline company engaged in the transportation, by pipeline, of natural gas not subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) under the Natural Gas Act.

Jurisdictional Agency: The State or Federal agency having regulatory jurisdiction over the production, transportation, and sale of natural gas.

LDC: Local Distribution Company.

Main Line Sale: Sales by interstate natural gas pipeline companies made directly to industrial customers or public authorities directly from the companies' transmission lines located outside field or production areas. Main line sales do not include sales made by field or production area transmission lines, intrastate pipeline companies, natural gas distribution companies, or sales by distribution companies that are operated by the pipeline company.

Make-Up Period: Time allowed for pipeline companies to take quantities of gas paid for but not previously taken.

Marginal Cost: The incremental change in cost associated with producing the last item.

Marketer: An individual, independent corporation, pipeline, producer, or local distribution company affiliate, engaged in the bringing together of sellers (producers) and buyers of off-system spot-market gas, assisting in negotiations, and arranging transportation and delivery terms. In some instances, marketers buy for their own position and broker and arrange transportation for their own sales.

Market-Out Clause: A contract clause that allows the purchaser to reduce the price below the current or redetermined price if the gas is not marketable at that price. The purchaser notifies the seller of an acceptable price. The seller can accept the new price, cancel the contract, or solicit third-party offers and provide "buyer right of first refusal" if the third-party offer is greater than the price specified by the buyer.

Market-Priced Gas (Market Clearing Price): Gas purchased (contracted for) and priced in an open market of offerers and bidders subject to supply and demand equilibrium.

Maximum Lawful Price: The highest price allowed under the Natural Gas Policy Act of 1978 (NGPA) for each of the defined categories or subcategories.

Minimum Clause: A clause in a rate schedule which provides that the charge for a prescribed period shall not be less than a specified amount.

Minimum Commodity Bill: A charge that requires the purchaser to pay the full commodity charge for a specified percentage of contracted quantities whether or not the specified amount of gas is actually taken.

Most-Favored-Nation Clause: This clause ties the contract price to the rates paid in other contracts. The contracts normally specify the geographic area to be taken into consideration, and that area can vary from a county, State or other potential subdivision, field, basin, or other geologic boundaries within or beyond State boundaries. Most contracts mention that only recent contracts for like quantity, quality, or contract terms can be taken in consideration. Included under this type of clause are:

- Highest contract price paid by buyer from same producing area
- Highest contract price from same producing area paid by any pipeline
- Average of highest contract prices from the same producing area.

Most of these contracts are three-party most-favored-nation types, meaning that any prices paid by interstate pipelines in an area are to be used. Others are two-party, which means the pipeline limits the contracts to be considered to contracts it alone has written recently.

Natural Gas Marketer: See Marketer.

NGPA Gas Categories: Natural gas pricing categories created by the Natural Gas Policy Act of 1978 (NGPA). The NGPA divided gas into a large number of sections, each subject to different pricing rules. Generally, gas was divided into three broad areas:

- Old Gas, including natural gas dedicated to the interstate market under Section 104 of the NGPA, or natural gas subject to rollover contracts under Section 106 of the NGPA.
- New Gas, covered by Sections 102, 103, 108, and 109 of the NGPA. This gas is dedicated to interstate markets after passage of the NGPA from new onshore or offshore wells, stripper-well gas and gas not covered by other Sections of the NGPA.
- High-Cost Gas, covered by Section 107 of the NGPA.

Off-Peak Gas: Gas supplied during periods of relatively low system demands as specified by the supplier.

Off-Peak Period: The period during a day, week, month, or year when the load being delivered by a gas system is not at or near the maximum volume delivered by the system.

Off-Peak Service: Service made available on special schedules or contracts, but only for a specified part of the year during the off-peak periods.

Offshore: Any area in the Federal Offshore: 3 miles or more offshore, except 10 miles or more offshore Texas. A well can be completely under water miles from land (in State water) and still be classed as an onshore well.

Off-System Supplies: Natural gas supplies purchased from other than the delivering pipeline or local distribution company. Usually gas bought on the spot market and transported to the recipient through the delivery chain for a fee. See system supply.

Old Gas: (See NGPA Gas Categories.)

Open-Access Transportation: The contract carriage delivery of non-system supply gas on a non-discriminatory basis for a fee. Generally subject to transportation tariffs which more often than not are on an interruptible service basis on first-come, first-serve capacity usage.

Operator: The person or firm responsible for the day-to-day operation of a plant or facility.

Optional Expedited Certificate (OEC): Per Federal Energy Regulatory Commission (FERC) Order 500, an OEC shortcuts the standard procedure for study and granting of pipeline construction requests. The condition for granting an OEC is that the company agree to bear the entire risk of the project (accept the market rate of return on the project, even if it falls below the fair rate of return normally granted to regulated operations).

Peak or Peak Load: The maximum consumer-demand for gas on a system during a specified interval: hour, day, week, month, or year.

Peak Responsibility: The load of a customer, a group of customers, or part of a system at the time of occurrence of the system peak.

Peaking Service: Service contract which entitles a distributor (buyer) to a certain quantity of gas that is delivered at the distributor's request. This type of service is usually available only during the winter months and is generally limited to buyers who are already purchasing gas under contract demand or general service contracts.

Price Ceiling: Statutory maximum lawful prices for various categories of natural gas, including gas destined for both the intrastate and interstate markets.

Rate Base: The original cost of plant used for gas service less contributions in aid of construction and reserves for depreciation, depletion, and amortization applicable to the plant plus an allowance for working capital. The rate of return is applied to the rate base to determine the amount of return which is intended to cover interest on debt, preferred stock dividends, and appropriate earnings on common stock equity.

Rate of Return: Percentage developed to be applied to a rate base to provide the amount necessary to cover debt interest, dividends on preferred stock, and earnings on common equity. The amount so determined is equivalent to net earnings from operations, or operating income. The rate of return is developed through a study of the "cost of capital" together with appraisal of other factors which require judgment.

Rate Schedule: The rates, charges, and provisions under which service is supplied to the designated class of customers. Also referred to as a service classification.

Right-of-Way Service: Service contract available to a distributor whose customers have granted easements or rights of way to a pipeline company. Agricultural customers who are in the vicinity of an existing pipeline are also eligible for this type of service upon the mutual consent of the distributor and the pipeline company. This type of service contract covers very small volumes, contains no stipulated contract quantities nor minimum bill provisions, and is interruptible except for domestic uses.

Sales for Resale: Sales for resale represent deliveries to other interstate pipelines and other gas utilities (local distribution and intrastate pipeline companies) that are to be resold. Federal Energy Regulatory Commission (FERC) approval and the granting of a "Certificate of Public Convenience and Necessity" must precede the commencement of gas deliveries and thereafter cannot be abandoned (terminated) by either party without FERC approval.

Seasonal Service: Service contract which provides gas deliveries to a distributor (buyer) during a specified part of the year (usually the winter months). This type of service contract contains a specific contract quantity and generally includes a full minimum bill. Additionally, purchasers who

use this type of service usually must be covered under a contract demand or general service agreement.

Service Agreement: An agreement between a natural gas company and a gas purchaser specifying the service to be rendered, area to be served, maximum obligation to deliver, delivery points, delivery pressure, applicable rate schedules by reference to the tariff, effective date and term, and identification of any prior agreements being superseded.

Spot Market: An open market of buyers and sellers bidding freely for available supplies of a commodity. In the natural gas market, this generally represents excess deliverability available on a short-term contract basis (usually less than a year) subject to price negotiation.

System Supply: Gas supplies purchased, owned and sold by the supplier or local distribution company to the ultimate end user. System gas is subject to Federal Energy Regulatory Commission (FERC) or State tariff and is generally sold under long-term (contract) conditions.

Take-or-Pay: Amount of gas required to be purchased even if it has not been physically delivered. Some percentages are based on minimum daily quantities, annual quantities, or minimum contract quantities. Take-or-pay quantities may change over time under initial provisions of the contract or may be changed in an amendment to the contract.

Threshold Volume: That volume of gas that must be taken to make the minimum bill provision inconsequential. That is, there would be no difference in the bills for gas with or without the minimum bill provision.

Transportation Net-back: Allowance made for transportation from the wellhead to point of delivery.

Transportation Program: A carriage program whereby the pipeline agrees to transport gas for the client for a fee and subject to various levels of service, but usually on an interruptible basis. Contracts may be either short- or long-term arrangements.

Utilization Factor: A ratio of the maximum demand of a system or part of a system to the rated capacity of the system or part of the system under consideration.

Variable Costs: All costs included in the cost of service which fluctuate with the volume of gas passing through the system.

WACOG (Weighted Average Cost of Gas): The total cost of all gas purchased by the pipeline/distributor during a base period divided by the system throughput during the same period. This rate, plus application of any pending surcharge adjustments, serves as the basis on which the system tariff rates are computed and made effective.

Warranty Contract Reserves: Gas supplies dedicated under gas purchase agreements for the sale of natural gas by a producer to a pipeline company wherein the producer warrants it will have available sufficient gas supplies to meet its commitments over the life of the contract. Generally, the producer does not dedicate gas reserves underlying any specific acreage, lease, or fields to the agreement. Substitution of various sources of gas supply may be permitted according to the terms of the contract.

Wellhead Price: The price received by the oil or gas producer for sales at the well.

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